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COMMITTED TO PROTECTION OF THE ENVIRONMENT —

COMPREHENSIVE MONITORING PROGRAM

Contract Number DAAA15-87-0095

FINAL SURFACE WATER DATA ASSESSMENT **REPORT FOR 1989**

JUNE 1990

Version 2.0

Volume III

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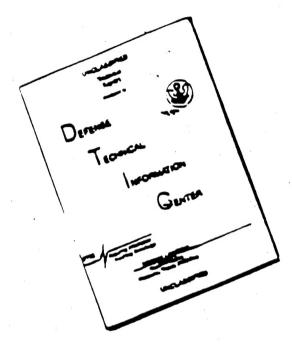
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COMPREHENSIVE MONITORING PROGRAM

Contract Number DAAA15-87-0095

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APPENDIX A

(Appendices A-1 to A-6)

Prepared by:

R. L. STOLLAR & ASSOCIATES INC.
HARDING LAWSON ASSOCIATES
EBASCO SERVICES INC.
DATACHEM,INC.
ENVIRONMENTAL SCIENCE & ENGINEERIN

ENVIRONMENTAL SCIENCE & ENGINEERING, INC. RIVERSIDE TECHNOLOGY, INC.

Prepared for:

U. S. ARMY PROGRAM MANAGER FOR ROCKY MOUNTAIN ARSENAL

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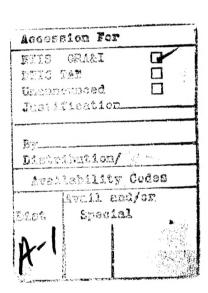


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APPENDIX A

Surface-Water Quantity Data for Water Year 1989

APPENDIX A-1

Surface-Water Station Survey Information

APPENDIX A-1.1

Monitoring Station Survey Information

Station #	Location	Northing	Easting	Elevation/GH
SW01001	N. Uvalda Interceptor	175,588.02	2,187,896.41	5,260.55 = TBM 5,258.92 = 3.33 on SG
SW01003	South Plants Ditch	177,784.84	2,185,793.81	5,255.61 = TBM 5,248.78 = 0.00 on SG 5,253.13 = PZF on SW Weir 5,252.21 = PZF on S Weir
SW01004	Upper Derby Lake	176,932.23	2,187,034.25	5,247.77 = 0.00 on SG
SW01005	Lower Derby Lake	176,414.44	2,183,945.48	5,230.17 = 0.00 on SG
SW02001	Ladora Weir	176,311.48	2,183,662.77	5,235.49 = TBM 5,228.84 = 0.00 on SG
SW02003	Ladora Lake	177,726.61	2,179,691.86	5,222.11 = 15.00 on SG
SW02004	Lake Mary	177,378.84	2,178,434.27	5,202.39 = 0.00 on SG
SW05001	South First Creek (old)	175,590.08	2,197,131.85	5,281.87 = TBM 5,278.58 = 0.00 on SG 5,278.91 = PZF
SW08003	South First Creek (new)	173,686.65	2,198,520.22	5,293.84 = TBM A 5,293.94 = TBM B 5,290.83 = PZF 5,290.82 = 0.00 on SG
SW11001	Peoria Interceptor	170,287.71	2,179,583.49	5,252.48 = TBM 5,250.28 = 3.33 on SG
SW11002	Havana Interceptor	170,992.86	2,178,854.75	5,261.49 = TBM 5,252.09 = 0.00 on SG
SW11003	Havana Pond	172,696.42	2,180,121.78	5,253.97 = TBM 5,244.08 = 0.00 on SG
SW12005	South Uvalda Interceptor	170,445.36	2,186,746.06	5,272.37 = TBM 5,274.40 = 3.33 on SG
SW12007	Highline Lateral	175,292.77	2,188,725.83	5,275.15 = TBM 5,275.10 = 3.33 on SG 5,272.63 = PZF
SW24001	Sewage Treatment Effluent	194,147.34	2,186,376.17	5,154.56 = PVC

Appendix A-1.1 Table A-1.1-1 (cont'd.)

Station #	Location	Northing	Easting	Elevation/GH
SW24002	N. First Creek (new)	195,311.93	2,187,575.26	5,146.52 = TBM A 5,146.01 = TBM B 5,141.75 = PZF 5,144.51 = 3.33 on SG
SW36001	Basin A	180,985.85	2,184,525.97	5,253.51 = TBM A 5,253.50 = TBM B 5,252.11 = 0.00 on SG 5,252.19 = PZF
SW37001	First Creek Off-post	199,013.30	2,180,816.71	5,108.99 = TBM 5,110.24 = 3.33 on SG 5107.43 = PZF Weir

SG = Staff Gage TBM = Temporary Bench Mark PZF = Point of Zero Flow

APPENDIX A-1.2

Station Survey Information

APPENDIX A-1.2

Cross-Section Survey Plots

Cross Sections were surveyed at the following stations:

North Uvalda (SW01001)
Peoria Interceptor (SW11001)
Havana Interceptor (SW11002)
South Uvalda (SW12005)
North First Creek (SW24002)

Two channel cross sections were surveyed below the structure, one cross section through the center of the structure, one cross section upstream of the structure through the existing staff gage and two additional cross sections were surveyed upstream of the staff gage. The maximum distance between adjacent cross sections was five channel widths.

One cross section was surveyed at Havana Interceptor along with upstream and downstream thalweg elevations for bed slope calculations. Four cross sections were surveyed at North Uvalda. Six cross sections were surveyed at Peoria Interceptor and South Uvalda. A total of five cross sections well surveyed at North First Creek.

Each cross seciton elevation is in feet mean sea level (MSL) and is tied to a vertical control (temporary bench mark - TBM) near each gage. All cross sections were surveyed from left bank to right bank looking in a downstream direction. Horizontal and vertical scales for plotting were selected independently for each station reach based on best visual representation of plots to actual site conditions. Cross-section plot number three and four for each station includes the staff gage elevations on the cross-section plot.

Plan view drawings were produced for each surveyed station. The plan views contain the following information:

Distance between cross secitons.

Location of the control structure.

Location of the stilling well.

Location of the staff gage.

Location of the TBM.

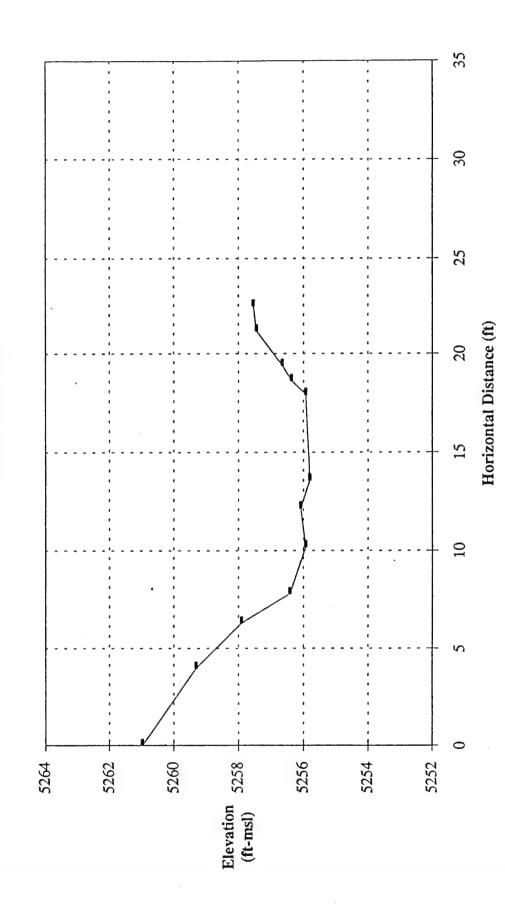
Direction of flow.

Average width of the channel.

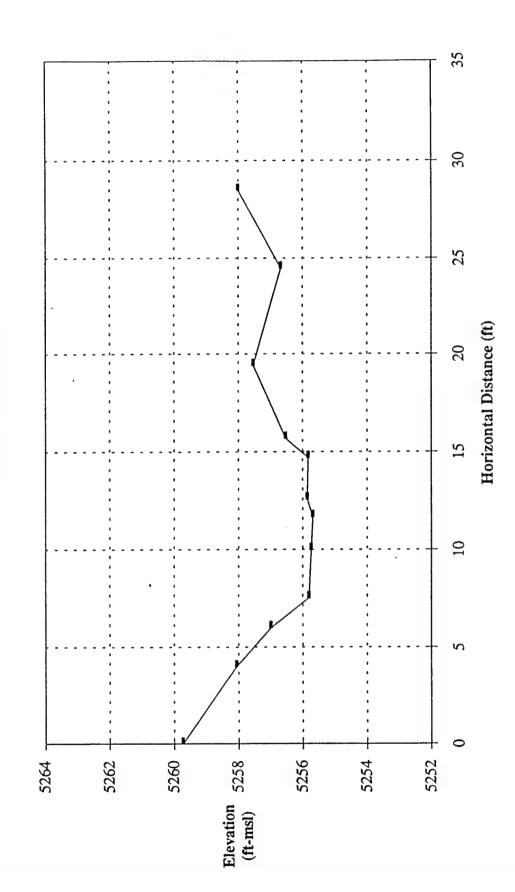
APPENDIX A-1.2.1

Cross Section Survey Plots

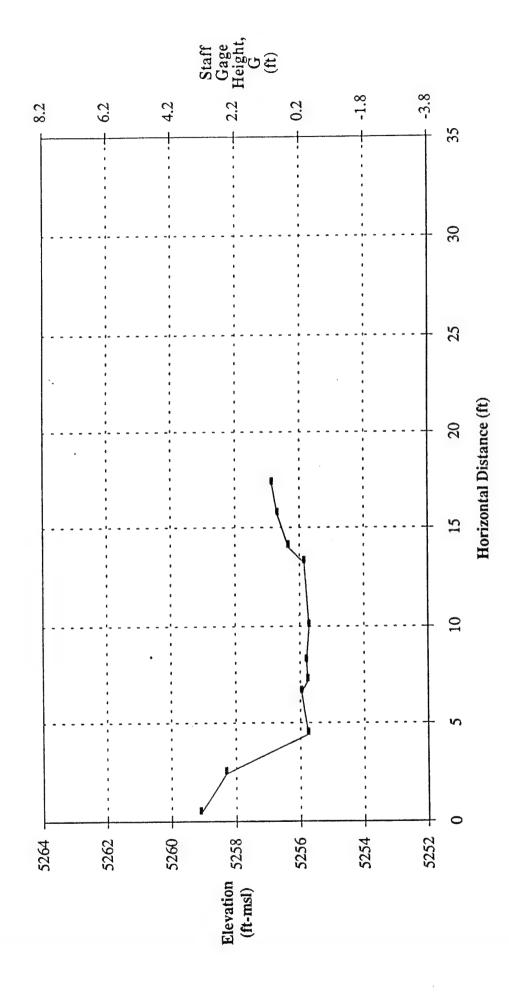
NORTH UVALDA (STATION SW01001) CROSS SECTION 1



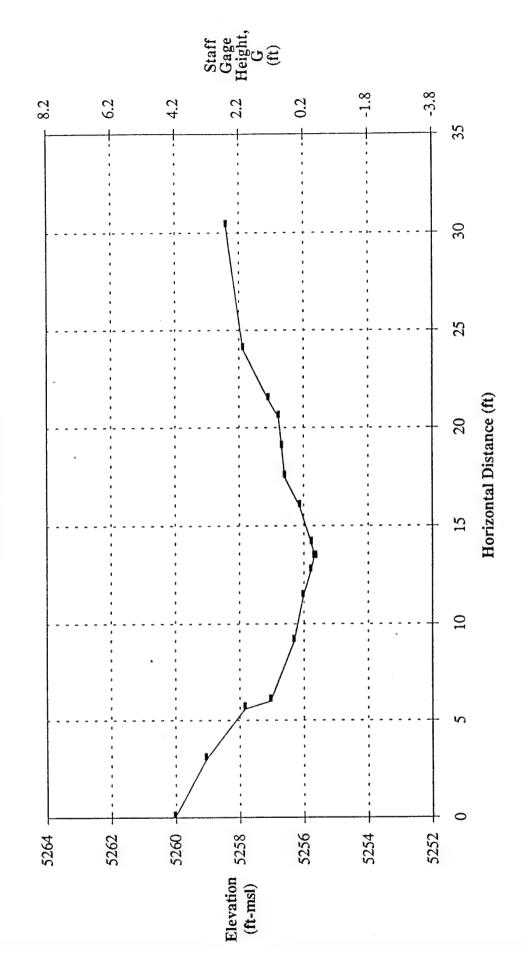
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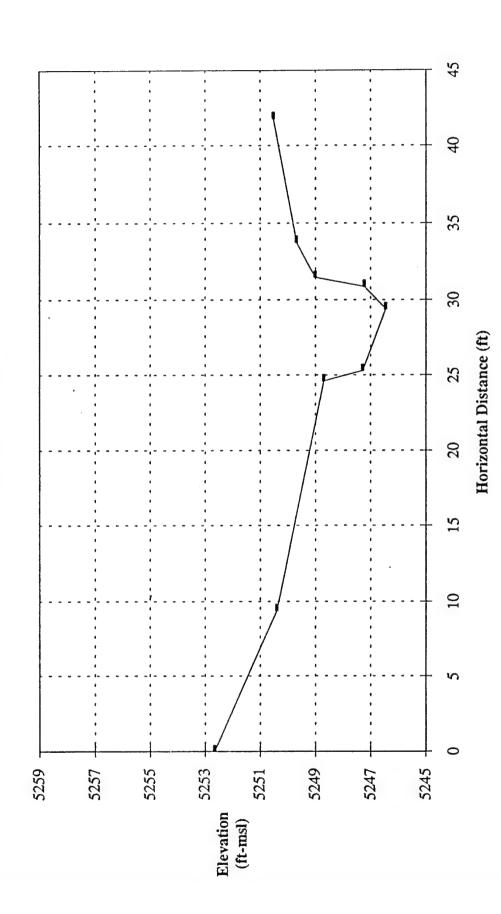
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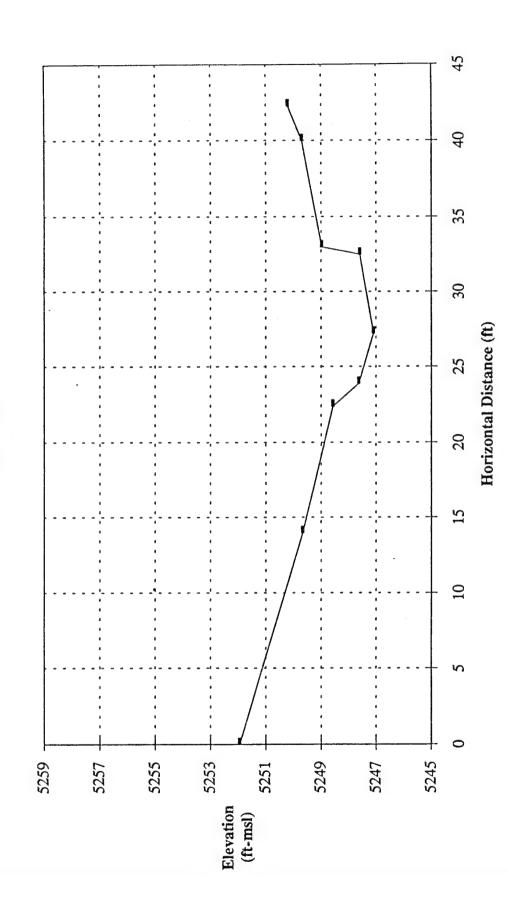
NORTH UVALDA (STATION SW01001) CROSS SECTION 4



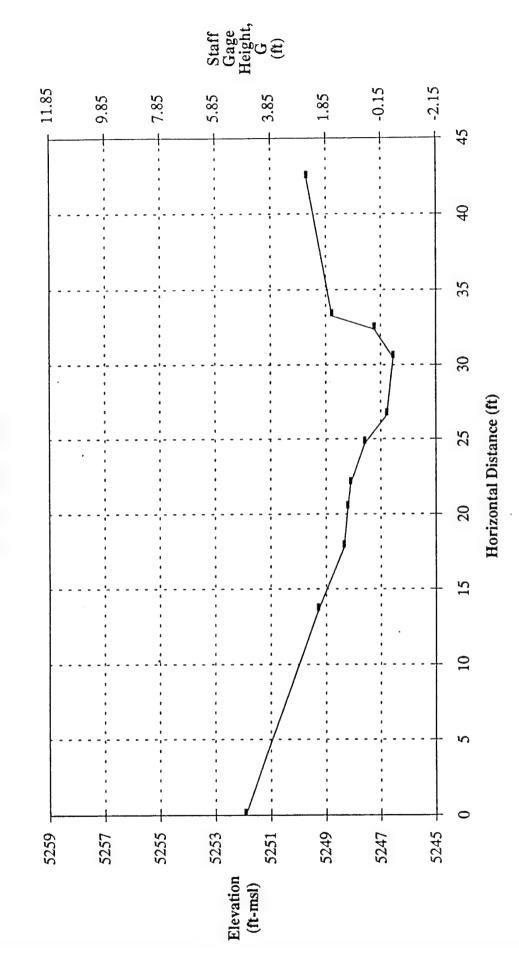
PEORIA INTERCEPTOR (STATION SW11001) CROSS SECTION 1



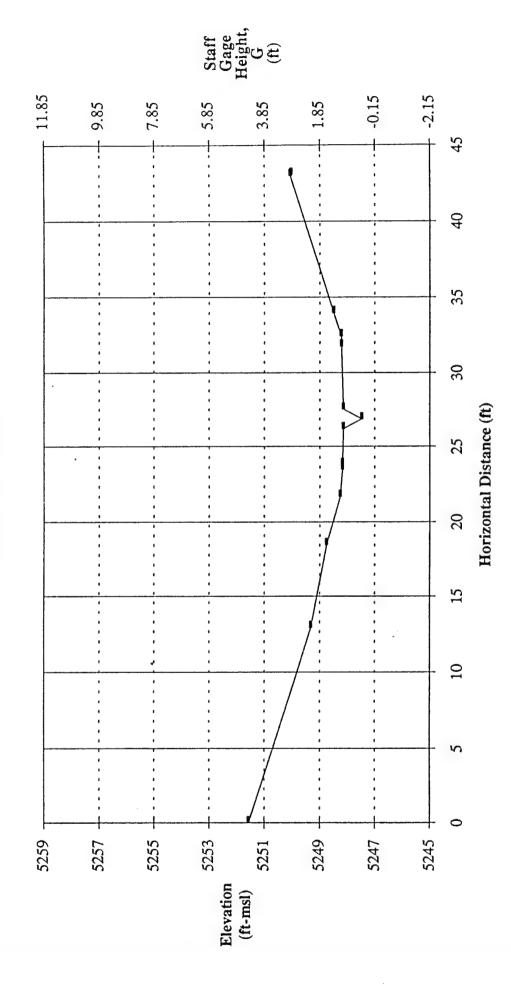
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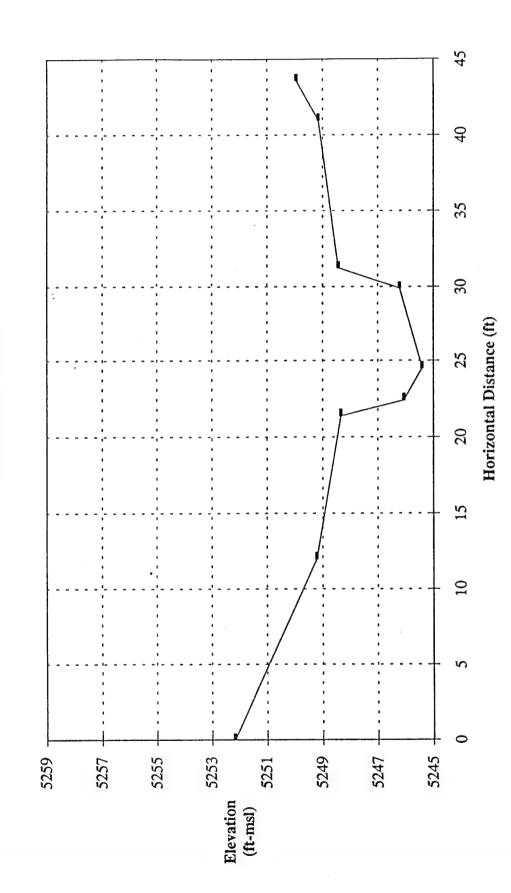
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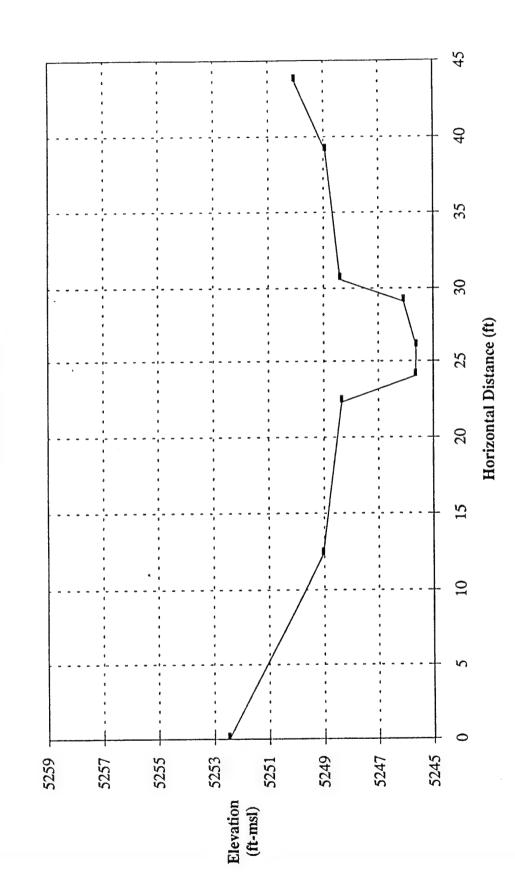
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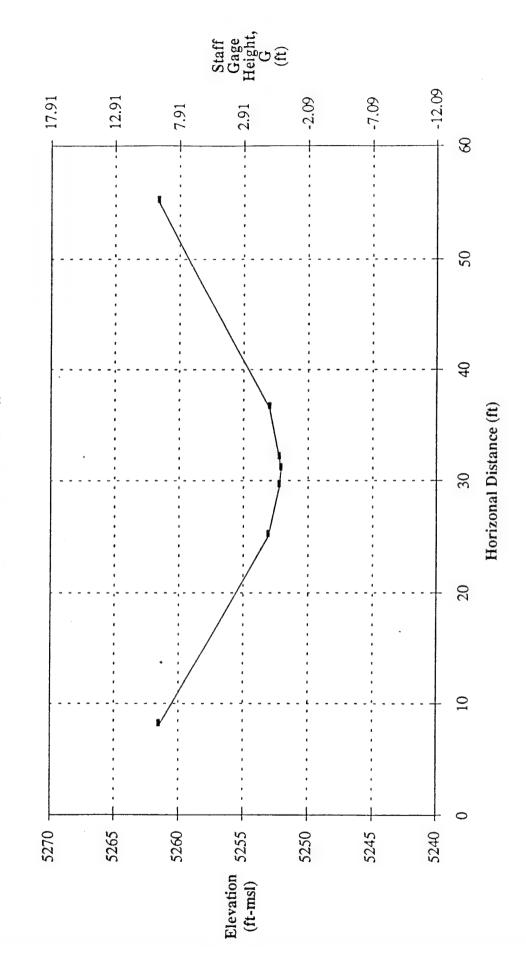
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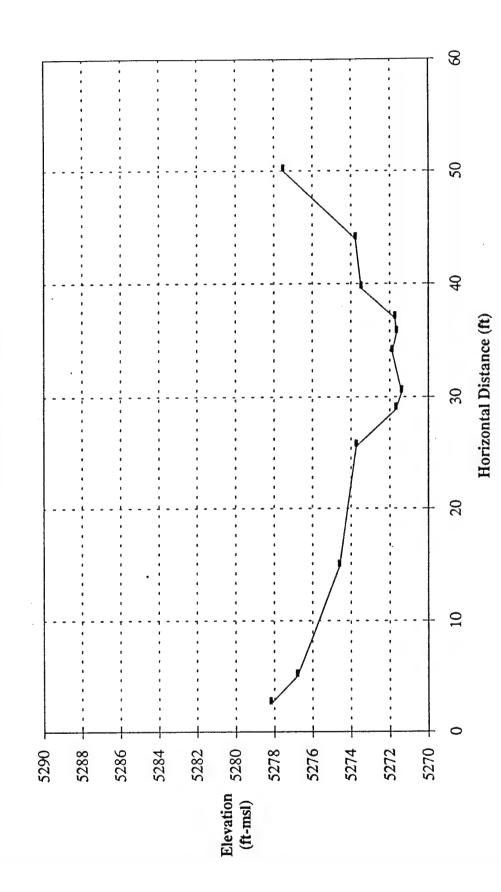
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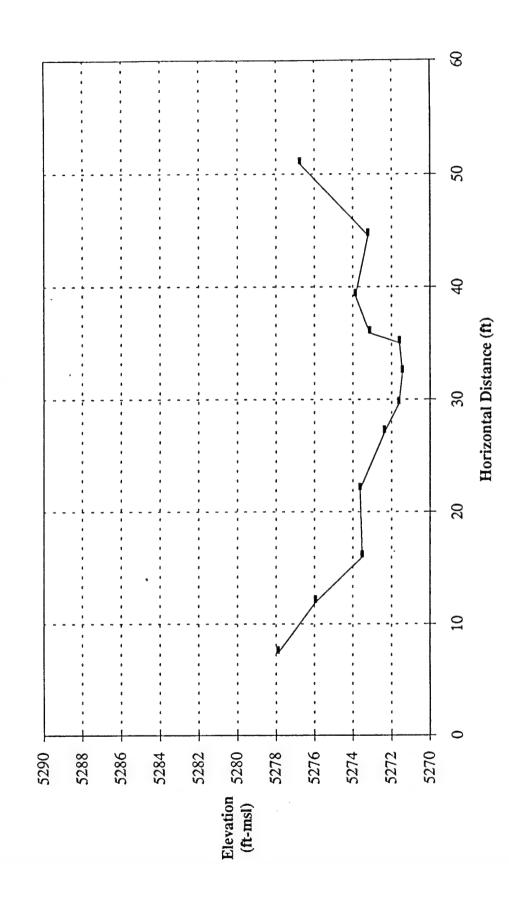
HAVANA INTERCEPTOR (STATION SW11002) CROSS SECTION 1



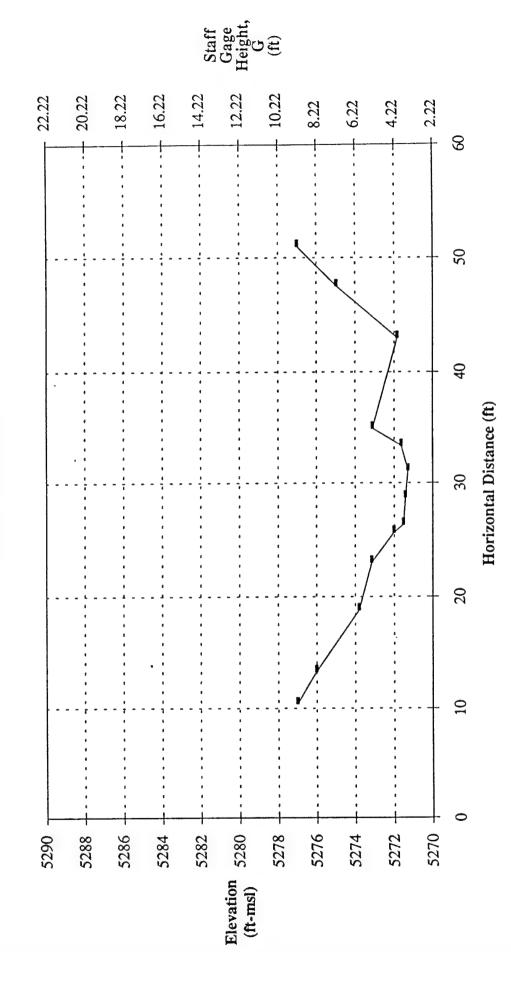
SOUTH UVALDA (STATION 12005) CROSS SECTION 1



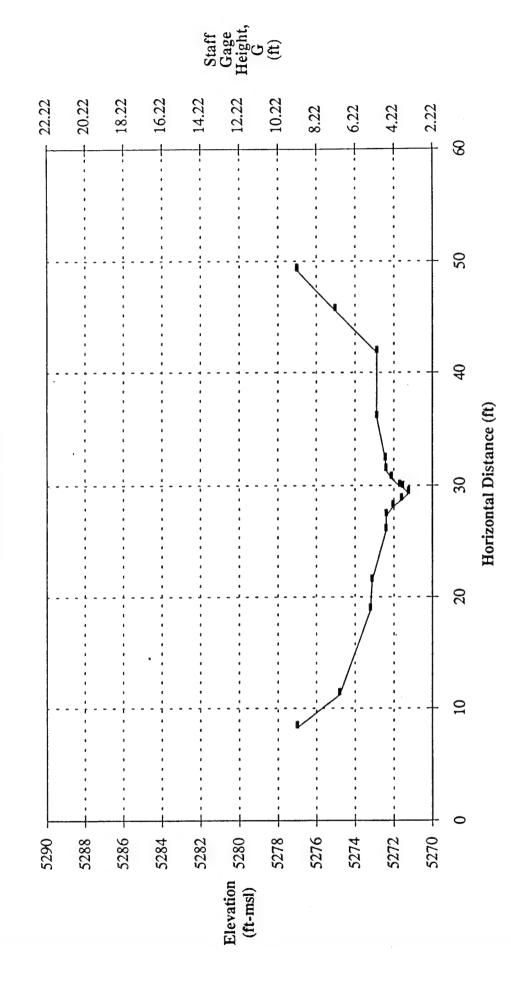
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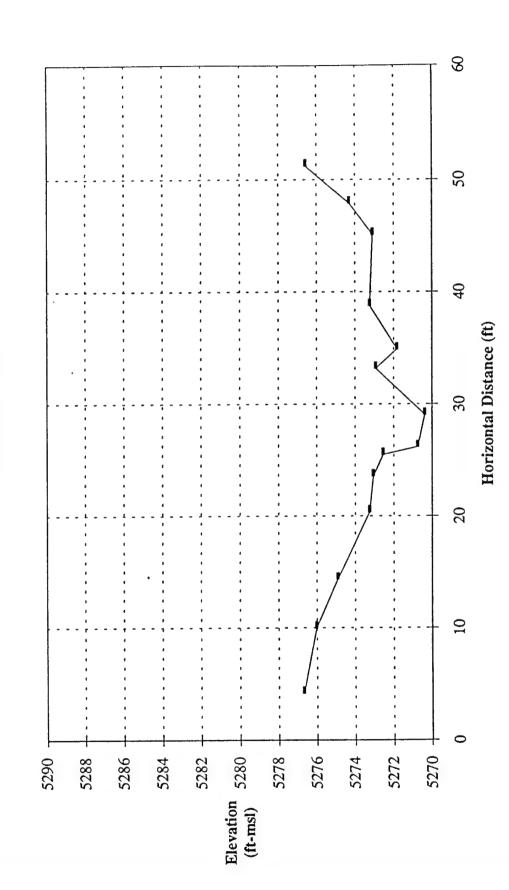
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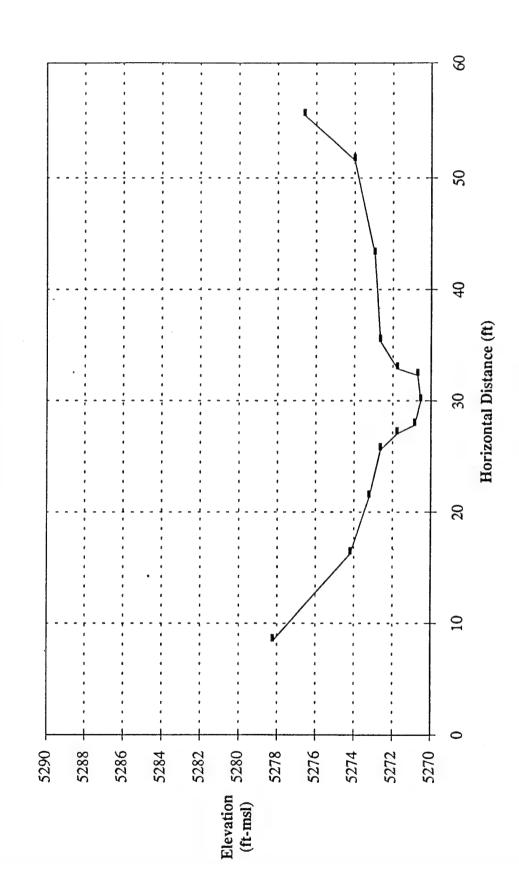
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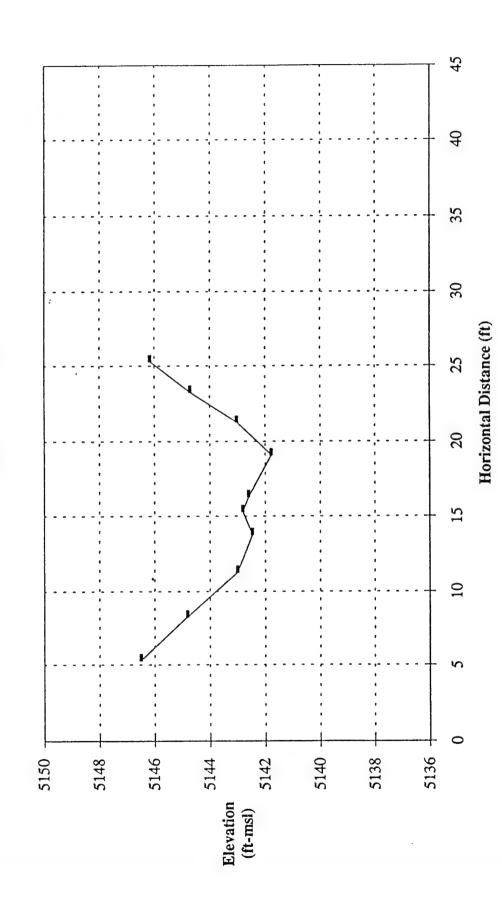
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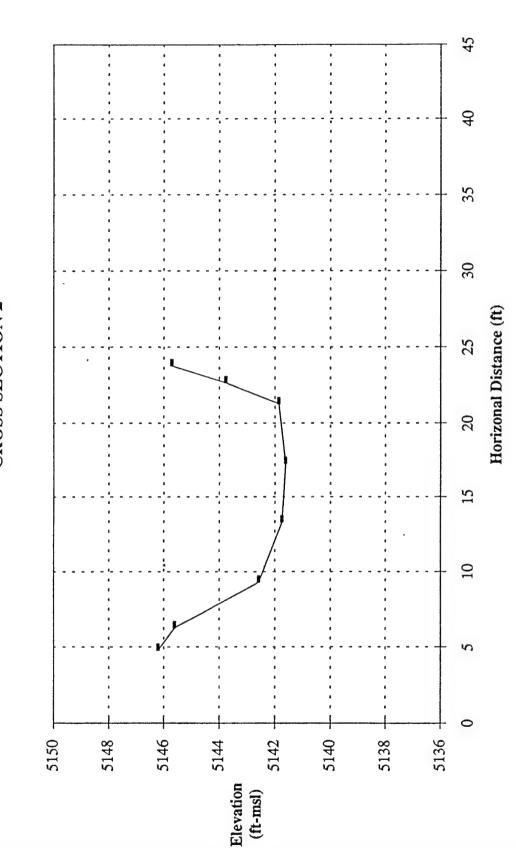
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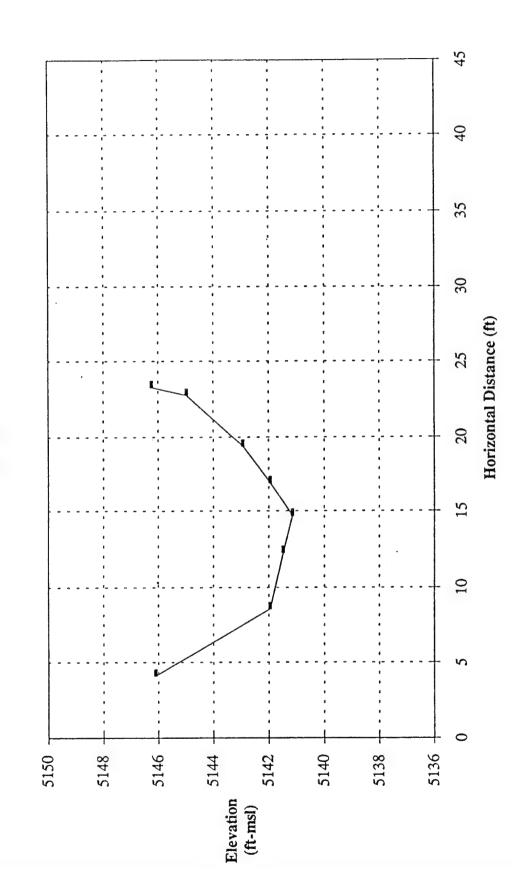
NORTH FIRST CREEK (STATION SW24002) CROSS SECTION 1



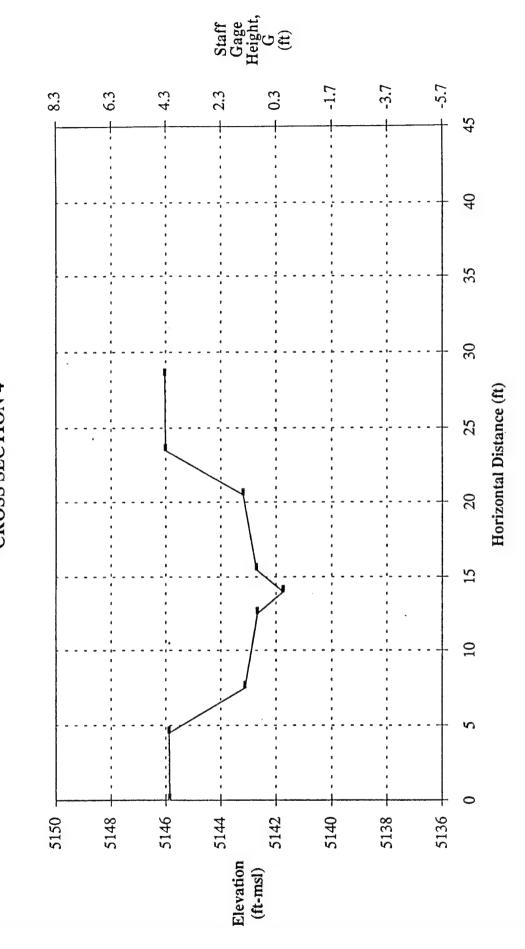
NORTH FIRST CREEK (STATION SW24002) CROSS SECTION 2



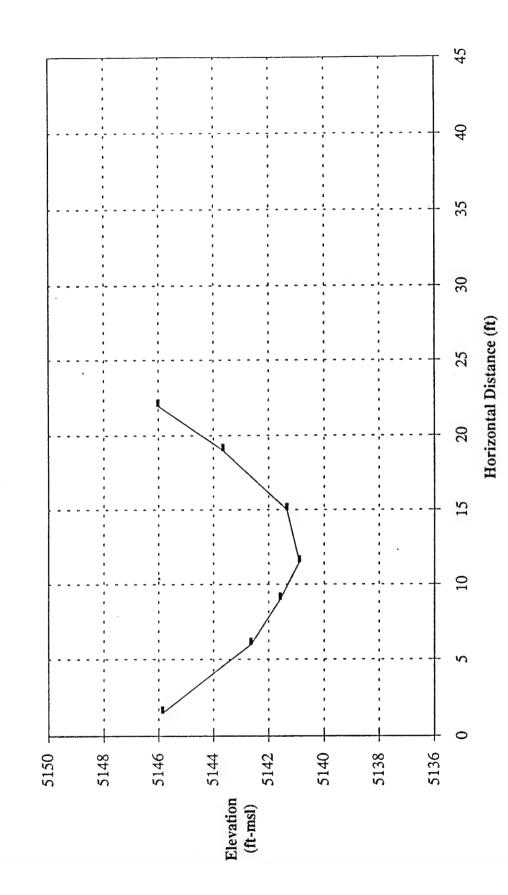
NORTH FIRST CREEK (STATION SW24002) CROSS SECTION 3



NORTH FIRST CREEK (STATION SW24002) CROSS SECTION 4

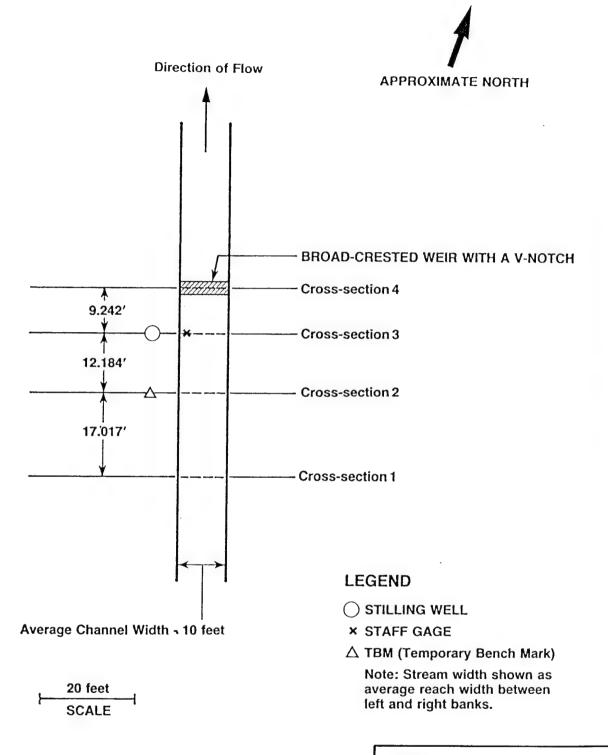


NORTH FIRST CREEK (STATION SW24002) CROSS SECTION 5



APPENDIX A-1.2.2

Monitoring Station Plan Views



Prepared for:

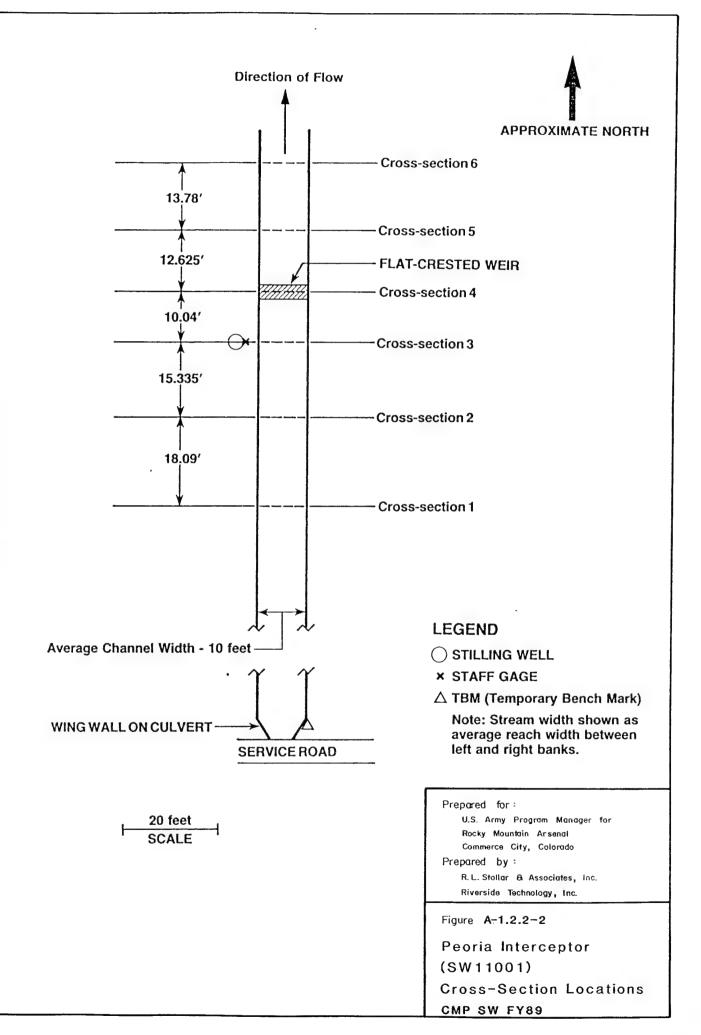
U.S. Army Program Manager for Rocky Mountain Arsenal
Commerce City, Colorado

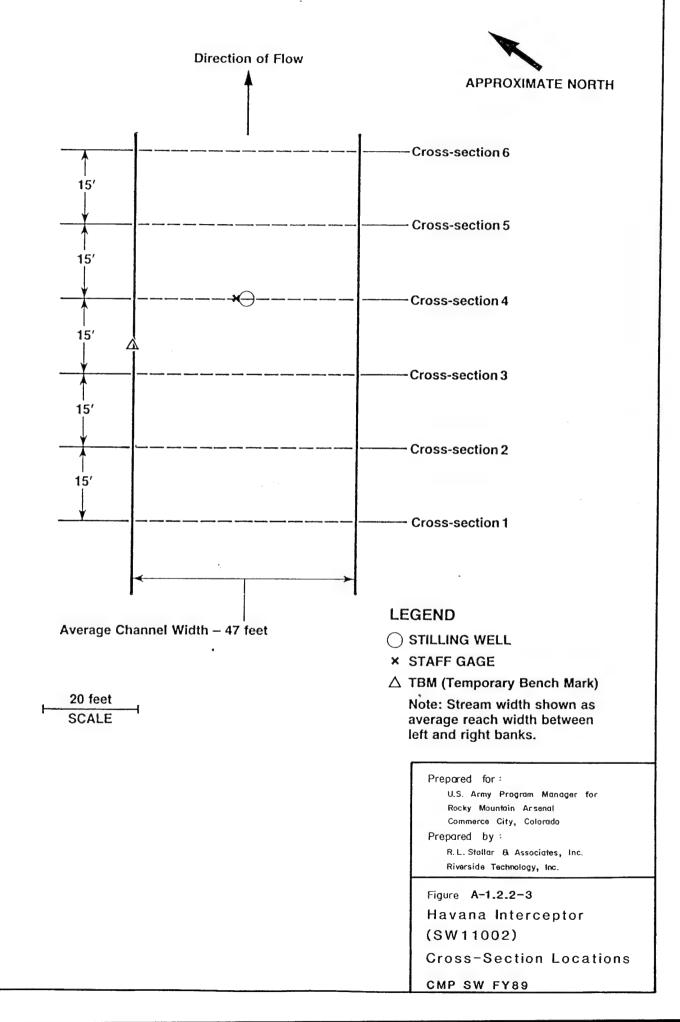
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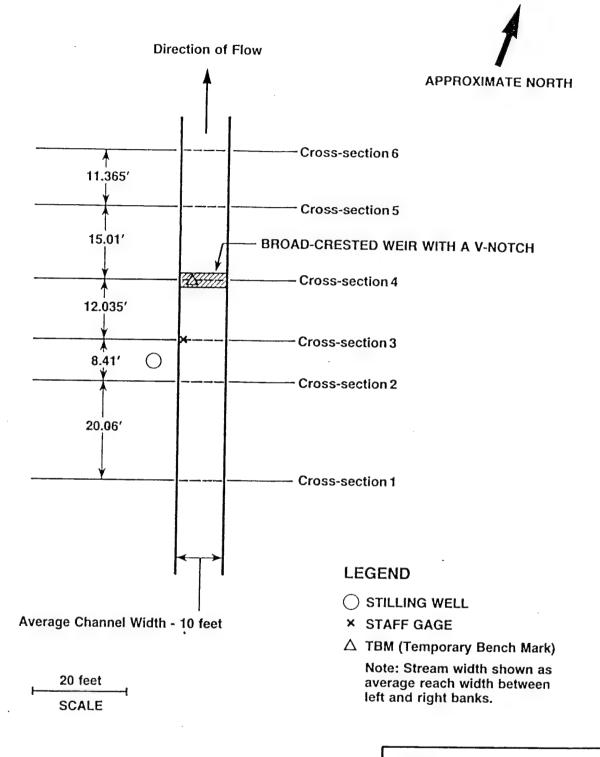
R.L. Stollar & Associates, Inc.
Riverside Technology, Inc.

Figure A-1.2.2-1

North Uvalda (SW01001) Cross-Section Locations



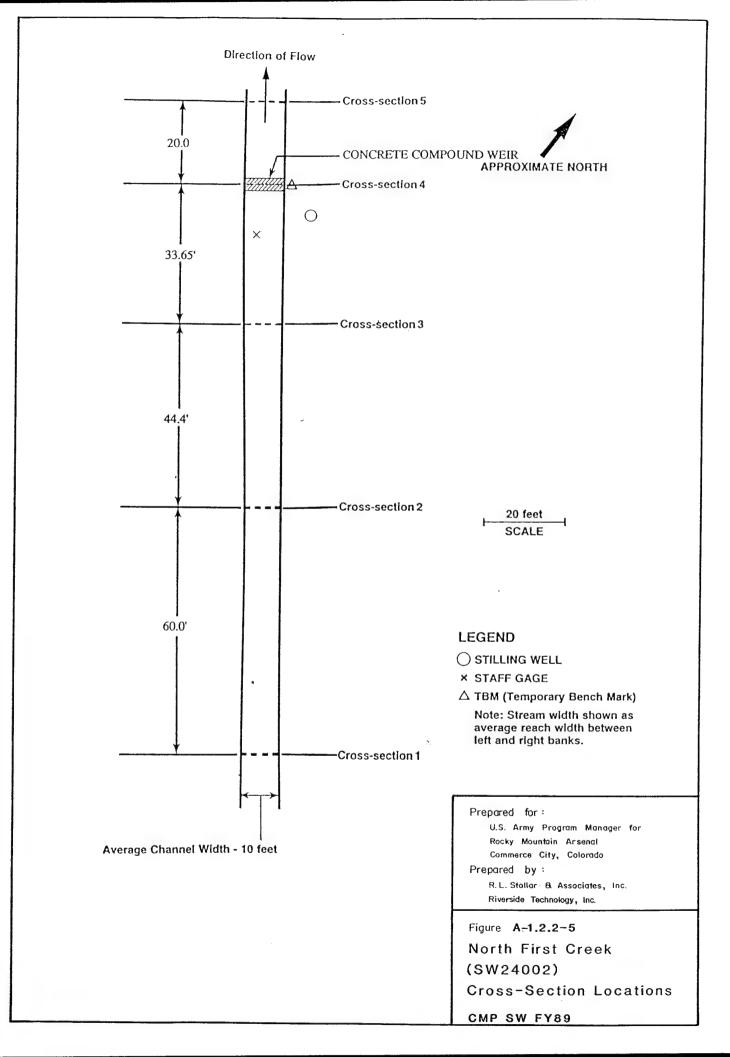




Prepared for:
U.S. Army Program Manager for
Rocky Mountain Arsenal
Commerce City, Colorado
Prepared by:
R.L. Stollar & Associates, Inc.
Riverside Technology, Inc.

Figure A-1.2.2-4

South Uvalda (SW 12005) Cross-Section Locations



APPENDIX A-1.2.3

Cross Section Survey Data

Table A-1.2.3-1 North Uvalda (SW01001) Cross Section Survey Data

Distance	Elevation	Horizontal Distance	Elevation
(ft)	(ft-msl)	(ft)	(ft-msl)
Cross Section 1		Cross S	ection 3
0.00	5260.980	0.40	5259.105
4.00	5259.310	2.40	5258.305
6.30	5257.915	4.40	5255.750
7.90	5256.425	6.60	5255.955
10.20	5255.925	7.20	5255.760
12.20	5256.090	8.20	5255.800
13.60	5255.805	10.00	5255.715
17.90	5255.925	13.20	5255.855
18.60	5256.370	14.00	5256.350
19.40	5256.655	15.70	5256.690
21.20	5257.445	17.30	5256.855
22.50	5257.550		
Cross Se	ection 2	Cross S	ection 4
0.00	5259.740	0.00	5260.040
4.00	5258.070	3.00	5259.055
6.00	5256.995	5.60	5257.840
7.50	5255.810	6.00	5257.040
10.00	5255.745	9.10	5256.315
11.70	5255.695	11.40	5256.025
12.60	5255.865	12.70	5255.790
14.70	5255.930	13.40	5255.695
15.70	5256.525	14.10	5255.775
19.40	5257.535	16.00	5256.125
24.50	5256.675	17.50	5256.585
28.50	5258.010	19.00	5256.675
		20.50	5256.775
		21.40	5257.095
		24.00	5257.880

Table A-1.2.3-2 Peoria Interceptor (SW11001) Cross Section Survey Data

Horizontal Distance (ft)	Elevation (ft-msl)	Horizontal Distance (ft)	Elevation (ft-msl)
Cross Se	ection 1	Cross Se	ection 4
0.00	5252.665	0.00	5251.580
9.40	5250.400	12.90	5249.315
24.60	5248.695	18.50	5248.760
25.30	5247.295	21.70	5248.260
29.40	5246.470	23.50	5248.180
30.90	5247.235	23.80	5248.480
31.50	5249.005	26.20	5248.150
33.80	5249.690	26.87	5247.480
41.80	5250.525	27.54	5248.150
41.00	3230.323	31.80	5248.210
		32.50	5248.220
		34.00	5248.500
		43.00	5250.070
		43.10	5250.030
Cross Se	Cross Section 2		ection 5
0.00	5251.955	0.00	5252.185
14.00	5249.655	12.00	5249.215
22.40	5248.570	21.40	5248.345
23.90	5247.630	22.40	5246.060
27.20	5247.095	24.50	5245.410
32.50	5247.590	29.90	5246.225
33.00	5248.970	31.30	5248.435
40.00	5249.700	41.00	5249.155
42.30	5250.205	43.60	5249.950
Cross Se	Cross Section 3		ection 6
0.00	5251.935	0.00	5252.480
13.60	5249.290	12.30	5249.045
17.80	5248.355	22.30	5248.350
20.40	5248.215	24.00	5245.625
22.00	5248.115	26.00	5245.625
24.70	5247.590	29.10	5246.085
26.60	5246.790	29.10	5246.085
30.50	5246.555	39.10	5248.935
32.40	5247.235	43.70	5250.055
33.30	5248.780	43.70	3230.033
42.40	5249.695		

Table A-1.2.3-3 Havana Interceptor (SW11002) Cross Section Survey Data

 Horizontal Distance (ft)	Elevation (ft-msl)	
8.00	5261.540	
25.00	5253.075	
29.50	5252,215	
31.00	5252.090	
32.00	5252,220	
36.50	5252,975	
55.00	5261.645	

Table A-1.2.3-4 South Uvalda (SW12005) Cross Section Survey Data

Horizontal		Horizontal	
Distance	Elevation	Distance	Elevation
(ft)	(ft-msl)	(ft)	(ft-msl)
Cross Section 1		Cross Section 3	
2.50	5278.170	10.42	5277.000
5.00	5276.790	13.33	5276.020
14.80	5274.610	18.83	5273.810
25.60	5273.740	23.03	5273.170
28.90	5271.680	25.63	5273.170
30.40	5271.380	26.33	5271.515
33.90	5271.885	28.73	5271.425
35.60	5271.730	31.13	5271.285
36.90	5271.730	33.33	5271.635
39.60	5273.470	34.93	5273.105
44.00	5273.770	43.03	5271.845
50.00	5277.520	47.53	5274.990
	•	51.23	5277.130
Cross Section 2		Cross Section 4	
7.42	5277.890	6.02	5277.615
11.92	5275.955	11.22	5274.810
15.92	5273.515	18.82	5273.210
22.02	5273.635	21.42	5273.135
27.12	5272.370	25.92	5272.400
29.62	5271.615	27.32	5272.400
32.42	5271.440	28.12	5272.040
35.02	5271.580	28.72	5271.600
35.92	5273.120	29.32	5271.240
39.22	5273.870	29.82	5271.535
44.52	5273.220	29.92	5271.695
50.92	5276.760	30.62	5272.130
		31.32	5272.405
		32.22	5272.435
		35.92	5272.885
		41.82	5272.880
		45.62	5275.040

Table A-1.2.3-4 South Uvalda (SW12005) Cross Section Survey Data (continued)

Horizontal		Horizontal	
Distance	Elevation	Distance	Elevation
(ft)	(ft-msl)	(ft)	(ft-msl)
Cross S	ection 5	Cross S	ection 6
4.17	5276.700	8.42	5278.230
9.97	5276.040	16.22	5274.190
14.37	5274.915	21.42	5273.205
20.37	5273.265	25.62	5272.640
23.57	5273.070	27.02	5271.770
25.47	5272.560	27.82	5270.840
26.17	5270.740	30.02	5270.525
29.07	5270.385	32.32	5270.690
33.17	5272.930	32.92	5271.770
34.87	5271.835	35.42	5272.660
38.77	5273.245	43.22	5272.950
45.17	5273.100	51.52	5273.995
47.97	5274.305	55.42	5276.615
51.17	5276.580		

Table A-1.2.3-5

North First Creek (SW24002) Cross Section Survey Data

Horizontal Distance (ft)	Elevation (ft-msl)	Horizontal Distance (ft)	Elevation (ft-msl)
Cross Section 1		Cross Section 4	
5.30	5146.500	0.00	5145.860
8.30	5144.820	4.50	5145.885
11.30	5143.010	7.50	5143.130
13.80	5142.820	12.50	5142.680
15.30	5142.470	14.00	5141.750
16.30	5142.610	15.50	5142.710
19.10	5141.780	20.50	5143.200
21.30	5143.040	23.50	5146.010
23.30	5144.720	28.50	5146.040
25.30	5146.160		
Cross Se	Cross Section 2		ection 5
4.80	5146.210	1.50	5145.870
6.30	. 5146.610	6.00	5142.640
9.30	5142.590	9.00	5141.590
13.30	5141.750	11.50	5140.900
17.30	5141.620	15.00	5141.340
21.30	5141.860	19.00	5143.660
22.70	5143.770	22.00	5146.020
23.80	5145.710		
Cross Se	ection 3		
4.10	4146.110		
8.60	5141.950		
12.30	5141.480		
12.30	5141.150		
16.90	5141.950		
19.40	5142.935		
22.80	5144.970		
23.30	5146.230		

APPENDIX A-1.2.4

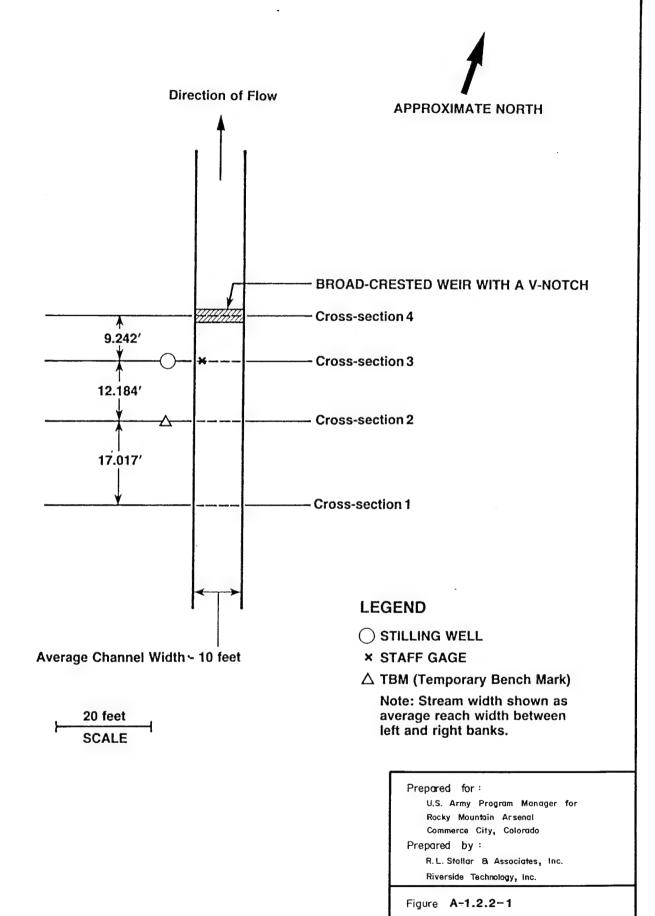
Channel Reach Survey Procedure

Vertical control was established by referencing to an existing temporary bench mark (TBM) located at or near each structure. Each TBM is permanently secured such that additional or future surveys can be referenced to the same elevation. The need to do additional surveying may arise as a result of flooding which could cause changes in channel geometry, from aggredation or degradation of the stream channel bottom as a result of increased or decrease sediment transport, and from modifications or changes in the control structure, staff location or staff elevation.

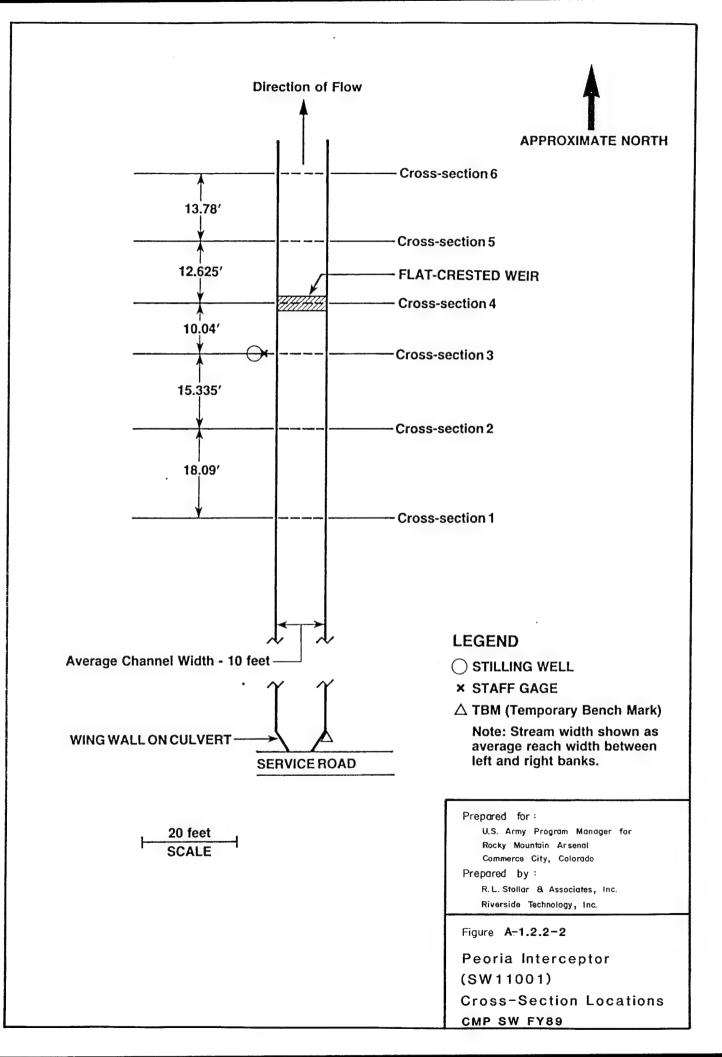
Each stream cross section was referenced either to the TBM or an established pin at the nearest upstream or downstream cross section to maintain vertical control. All rod readings were recorded to the nearest 0.005 feet. For each surveying instrument location, a backsight and foresight to established pins was recorded. All level loops were closed on the original TBM at each location, with an allowable vertical closure error not-to-exceed 0.01 feet. An end-to-end test or "peg test" was conducted on the surveying instrument each day prior to use to ensure instrument accuracy.

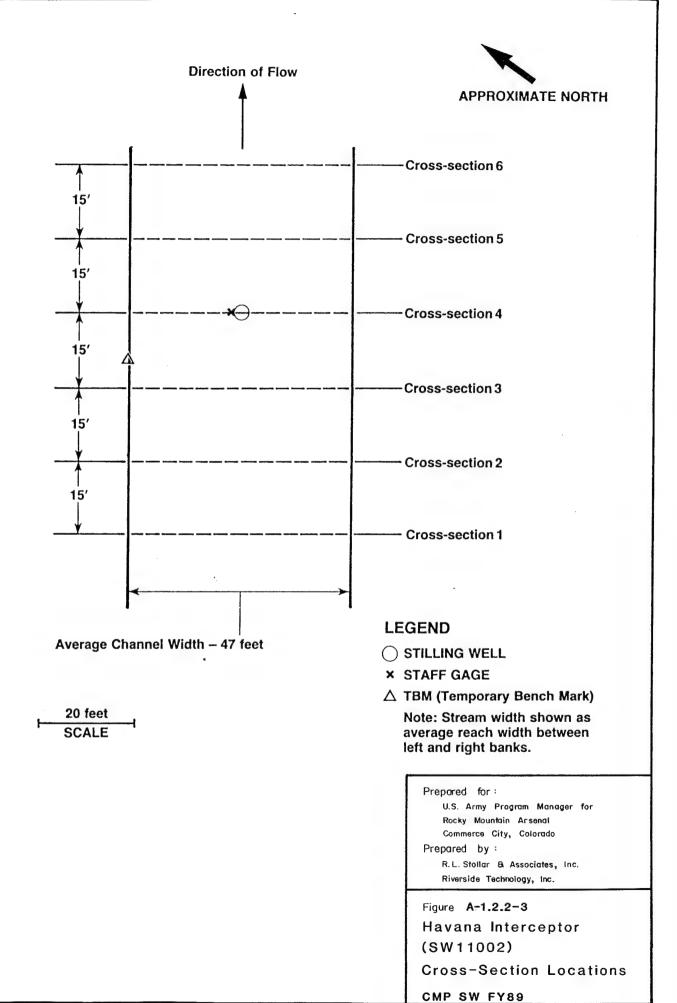
Horizontal control was established by driving 5/8-inch rebar stakes (pins) at the endpoints of each cross section. The pins serve as reference locations for each cross section and may be used for future surveys, if required. Each pin was tagged with aluminum tags etched with the station identification, pin identification and date. Pins were positioned on both sides of the stream channel perpendicular to flow lines in the stream. The location of the pins is high enough such that a wide range of high flows will be contained within the surveyed cross sections. Each pin was hammered into the ground approximately 1.5 feet. The remaining 0.5 feet was painted orange and tagged with orange surveyor's flagging for ease of locating in the future. For step-backwater modeling purposes, baseline and azimuth measurements were not required. Since all cross sections were staked and identified, horizontal control with reference to magnetic north can easily be obtained by additional surveys.

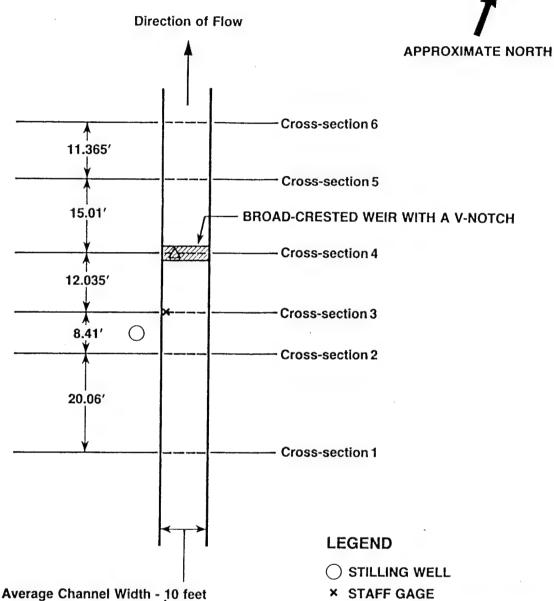
All cross sections were surveyed from left to right looking in a downstream direction. Horizontal stations were determined to the nearest 0.1 feet using a cloth tape stretched between the pins. Horizontal stationing was determined for all slope breaks along each cross section, for the left and right overbank reaches, left and right channel banks, left and right edge of water and for the thalweg of each cross section. Additionally, the water surface elevation at each cross section were determined to compute the energy grade of a particular reach.



North Uvalda (SW01001) Cross-Section Locations







20 feet SCALE

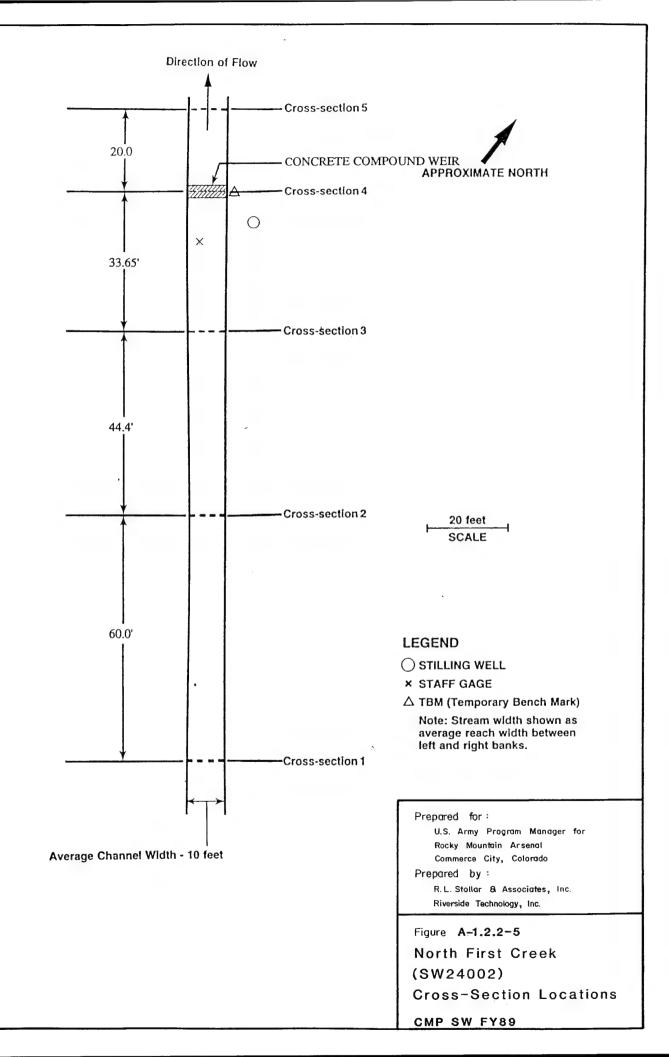
- △ TBM (Temporary Bench Mark)

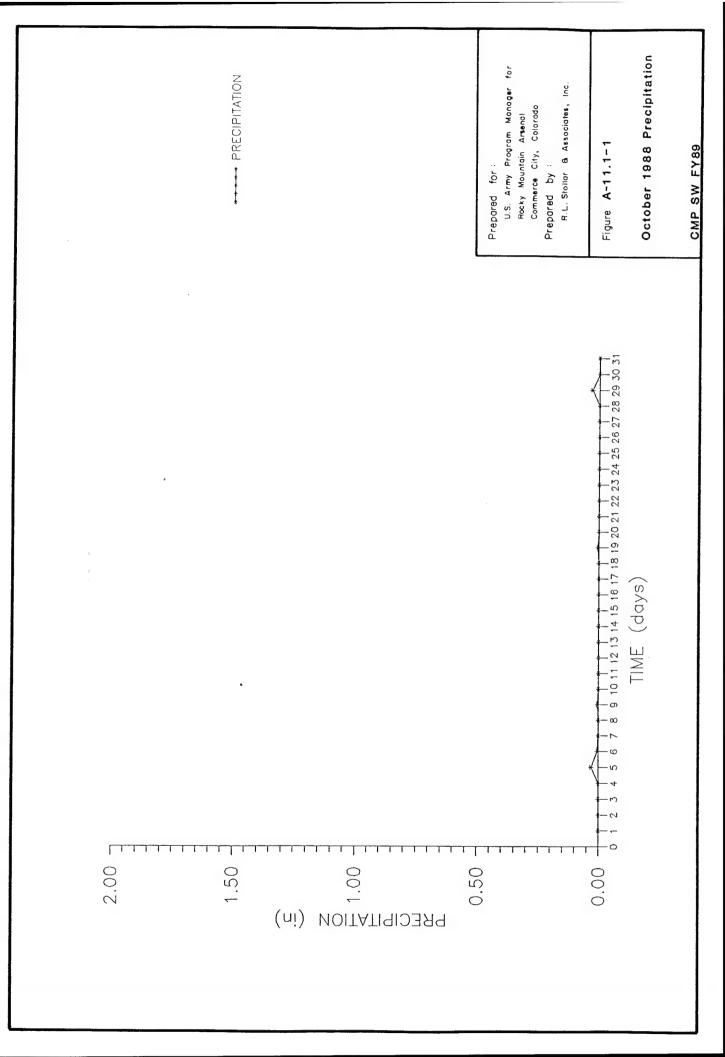
Note: Stream width shown as average reach width between left and right banks.

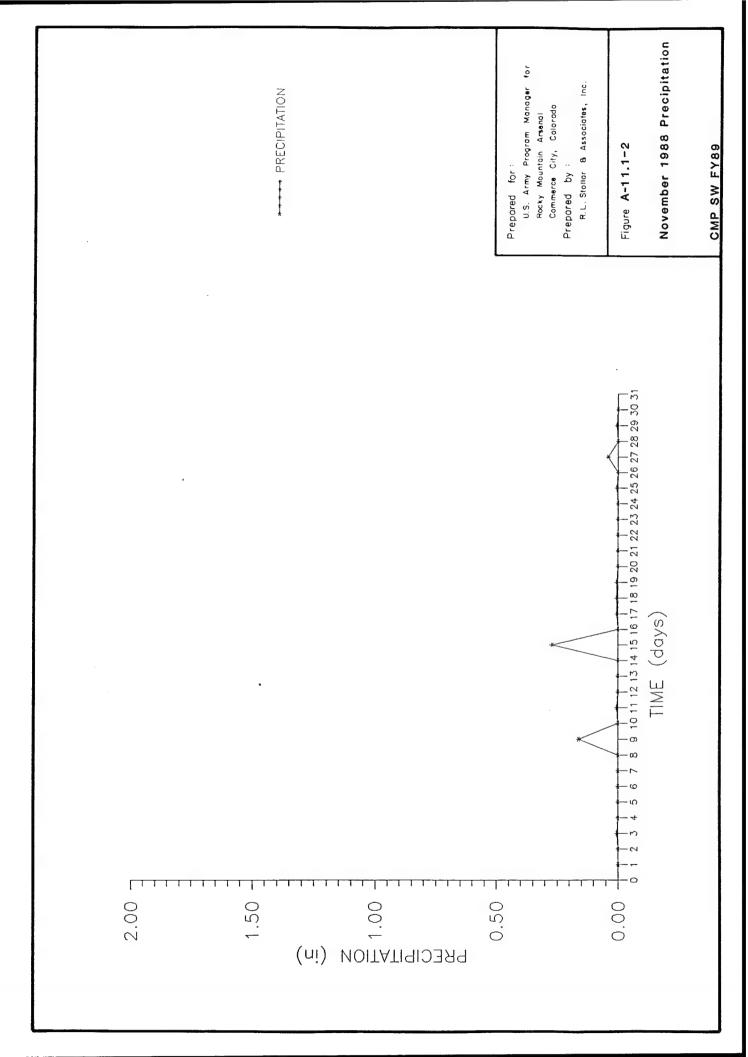
> Prepared for: U.S. Army Program Manager for Rocky Mountain Arsenal Commerce City, Colorado Prepared by: R.L. Stollar & Associates, Inc. Riverside Technology, Inc.

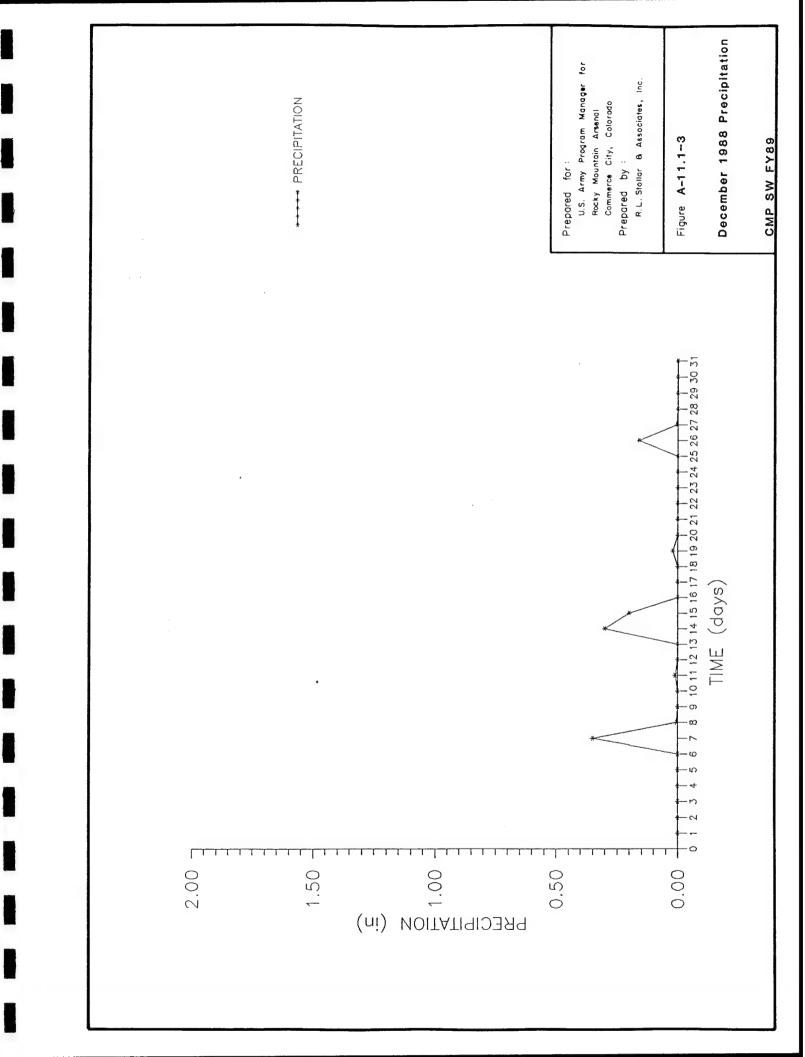
Figure A-1.2.2-4

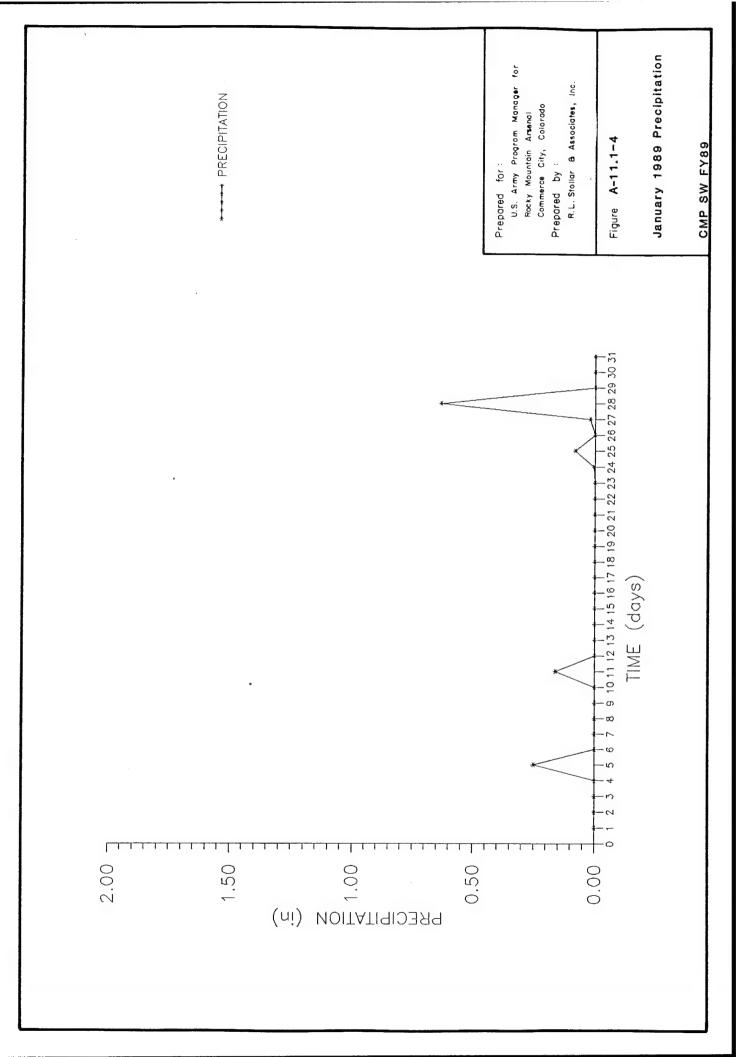
South Uvalda (SW 12005) Cross-Section Locations

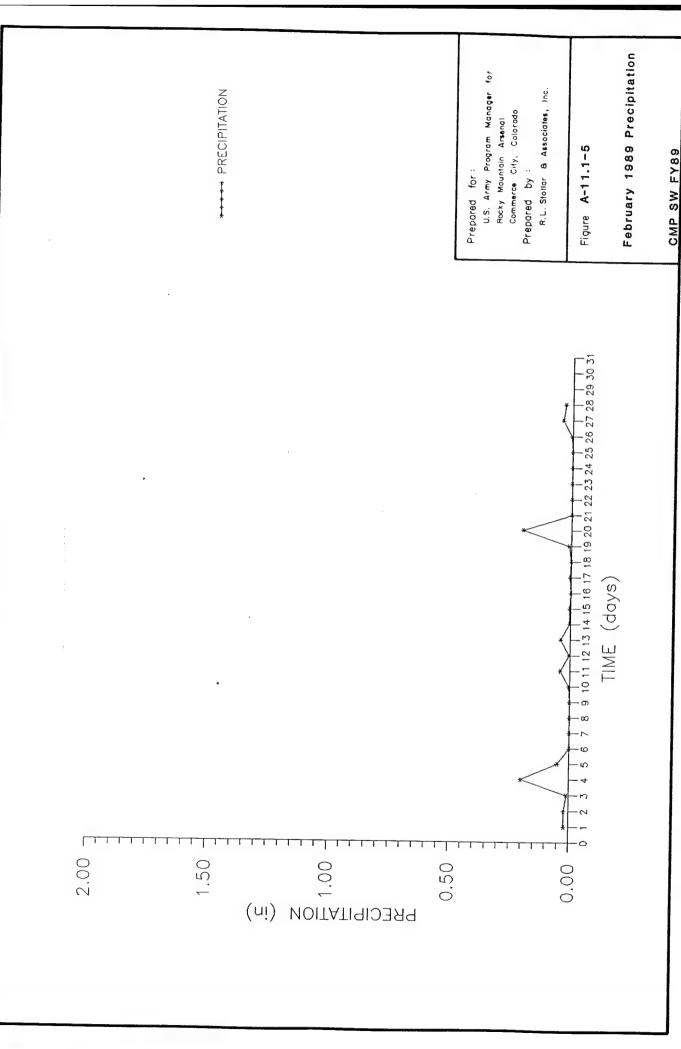


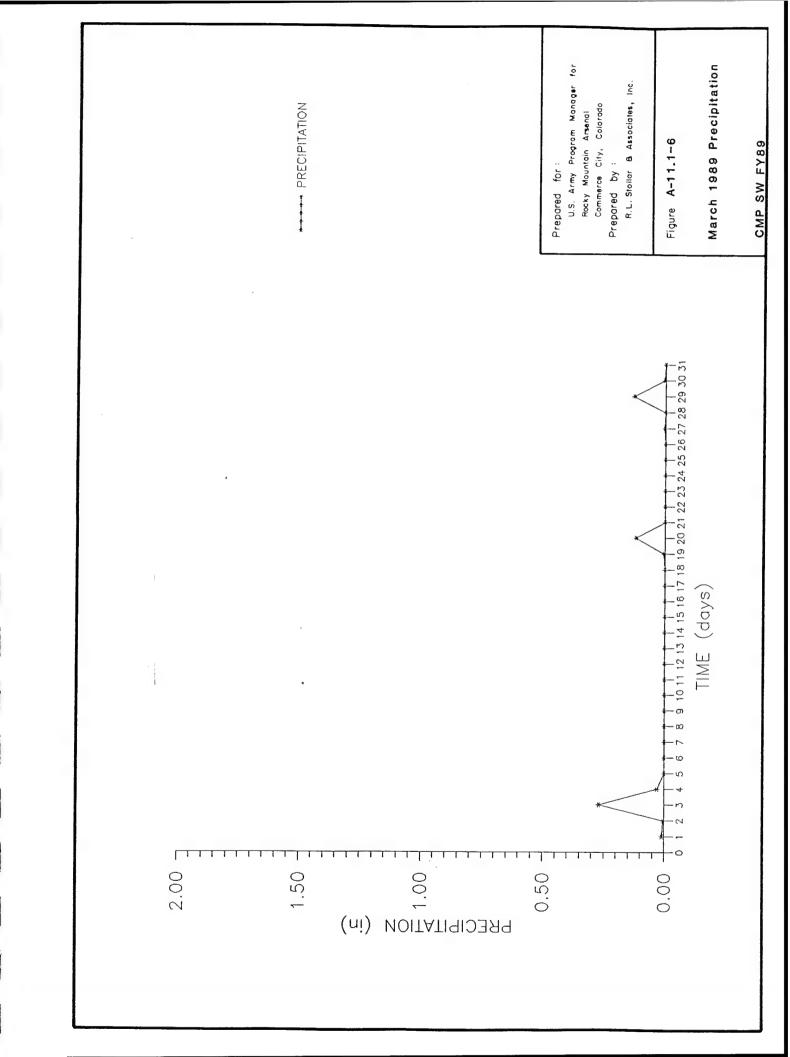


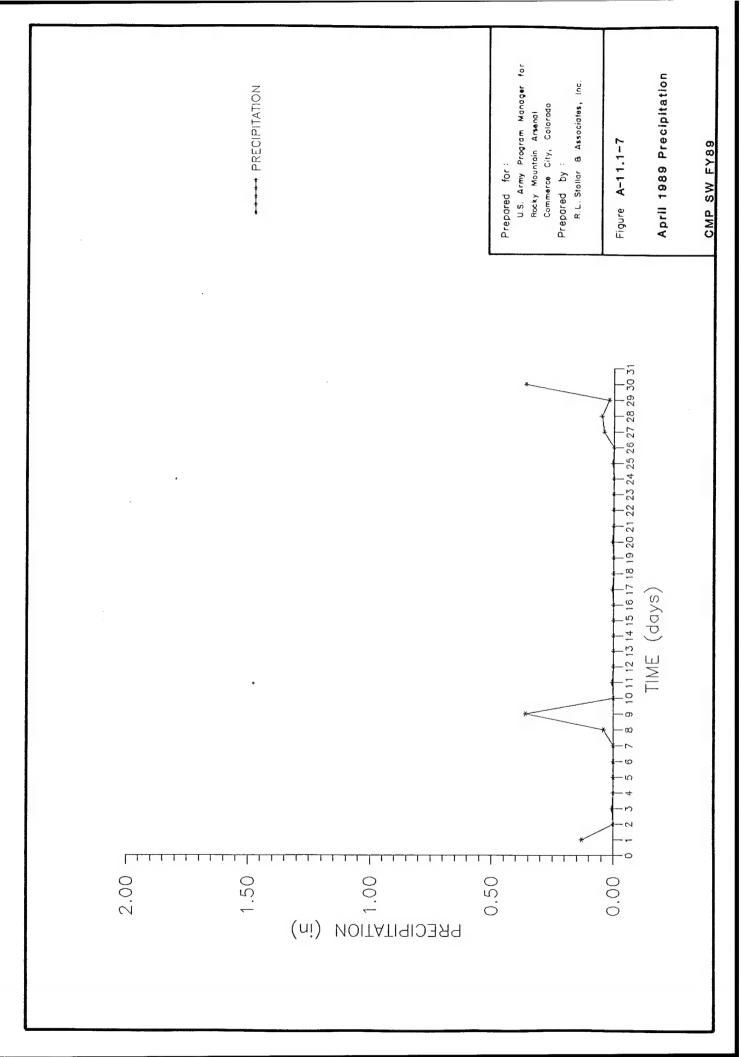


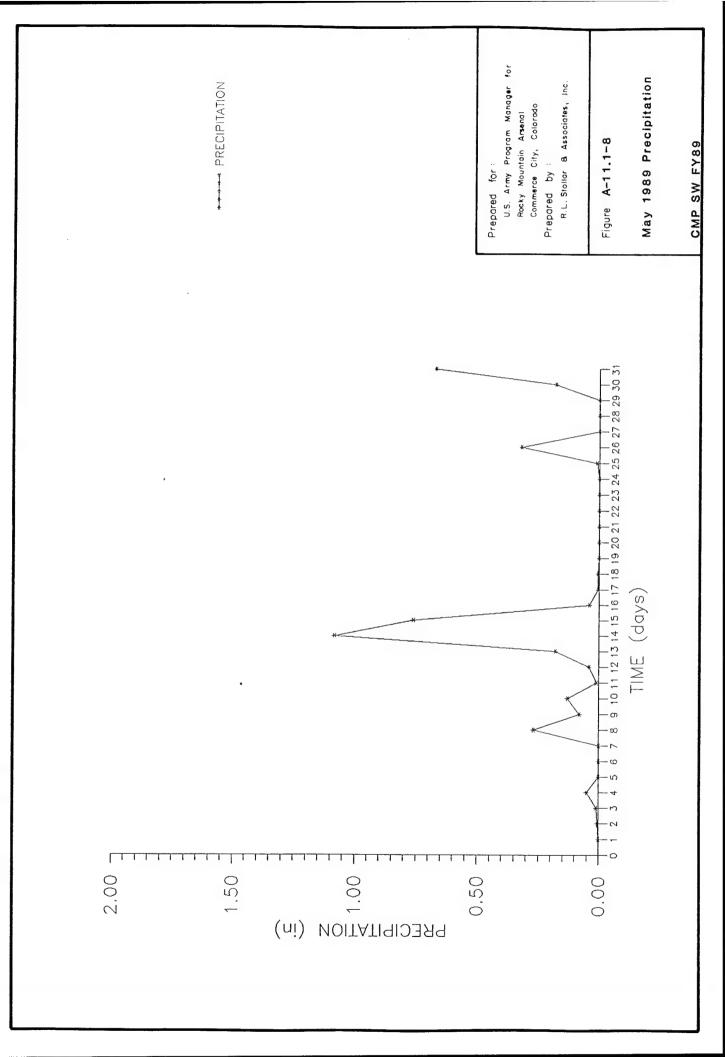


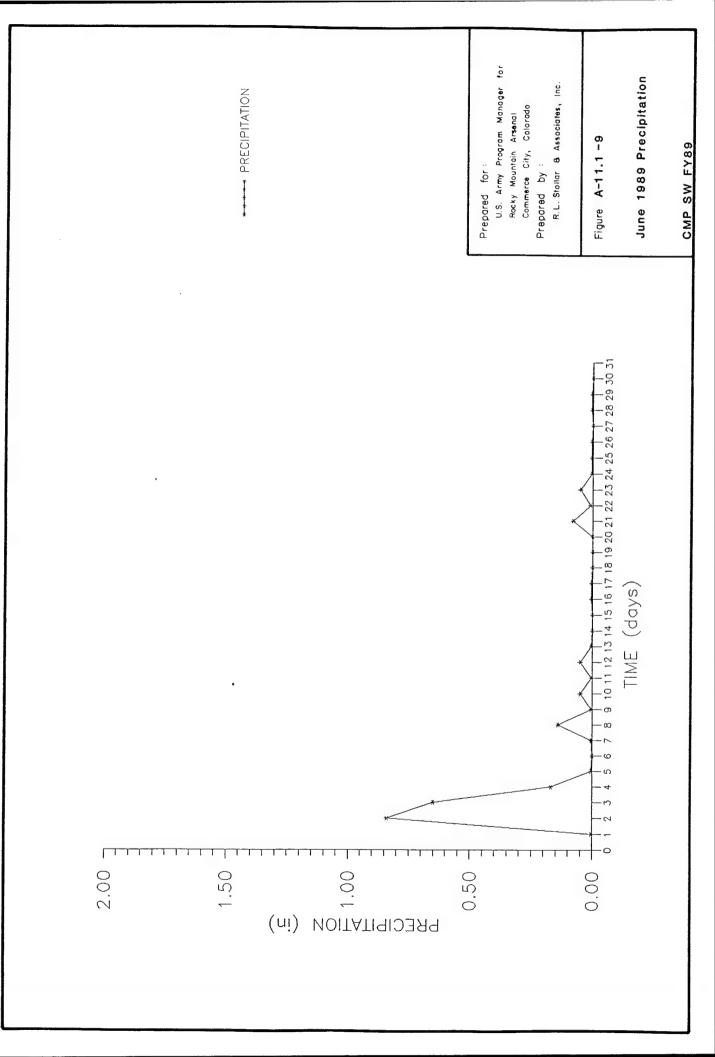


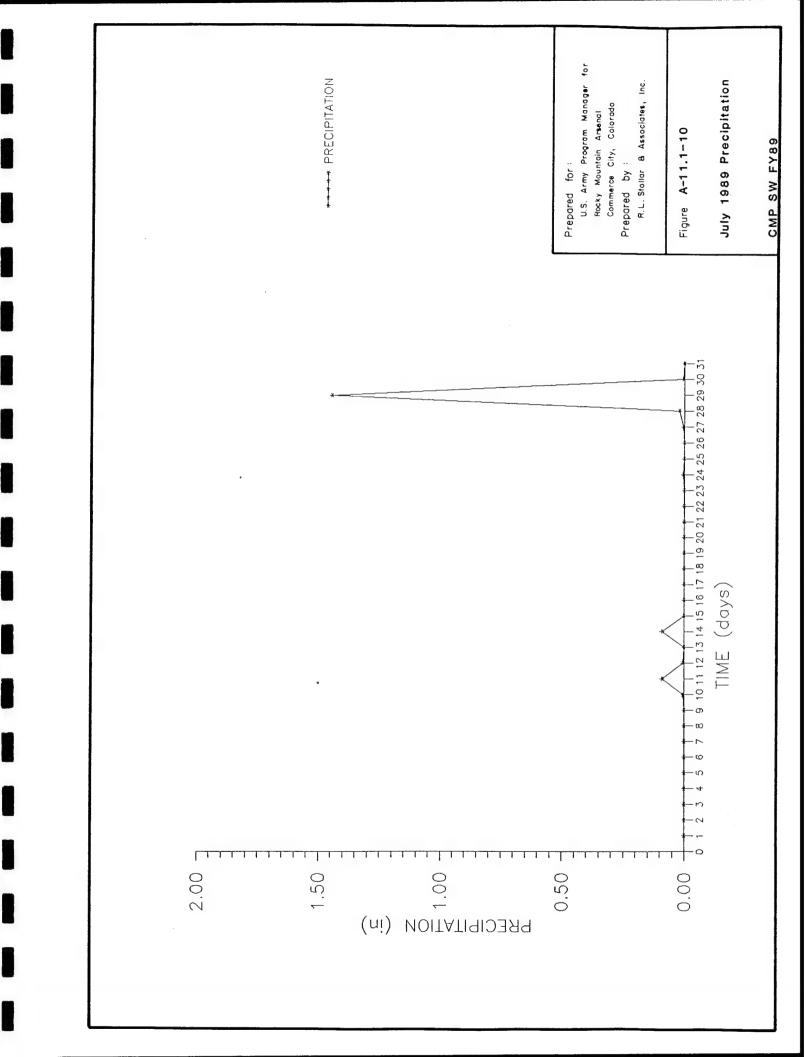


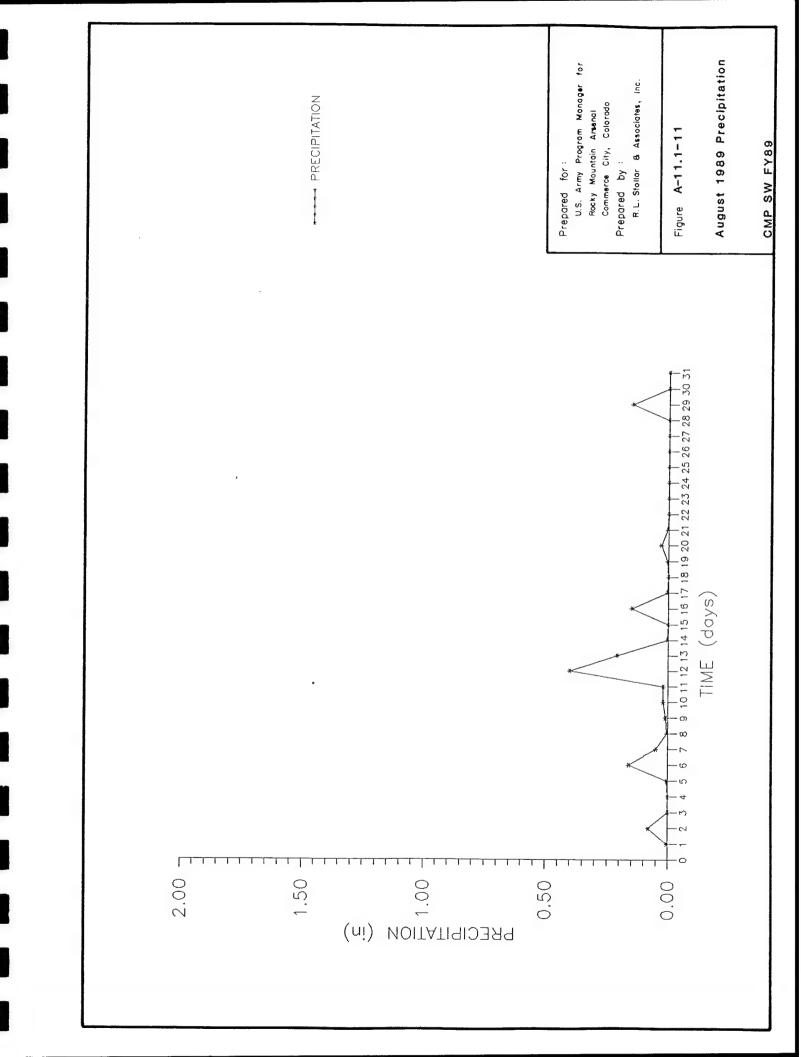


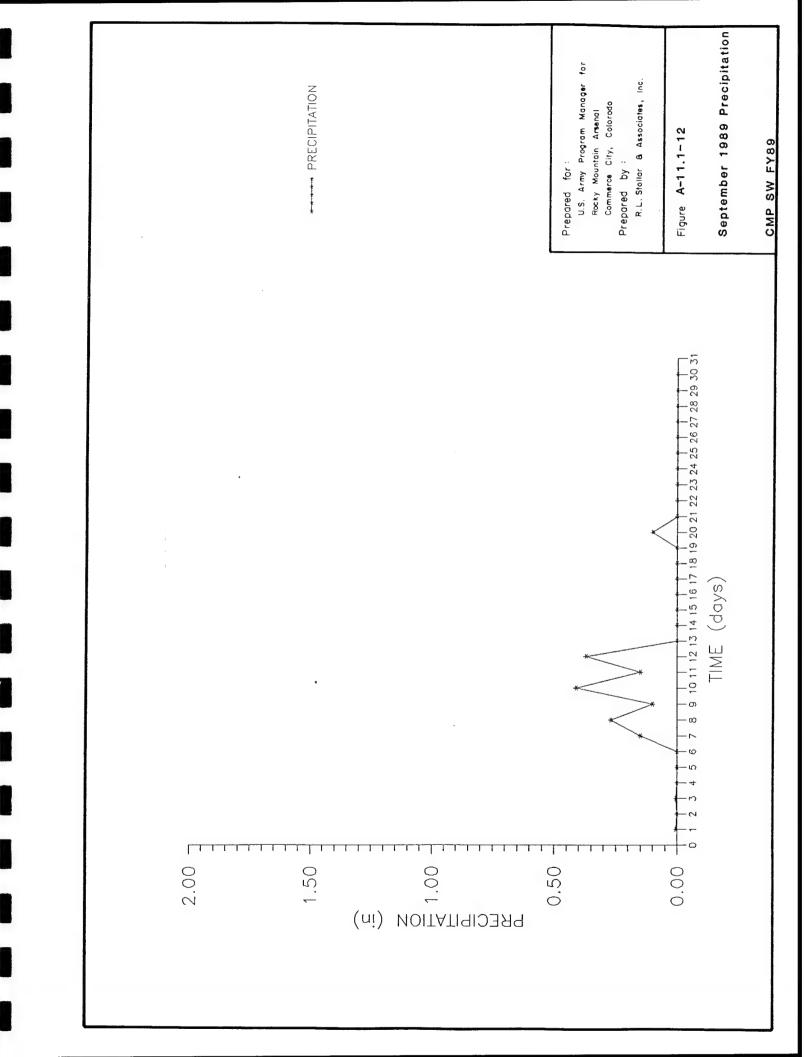












APPENDIX A-2

Instantaneous Discharge Measurements

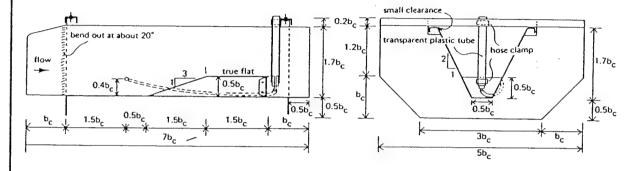
APPENDIX A-2.1

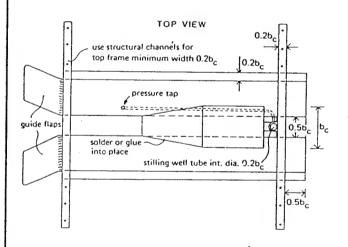
Flume Specifications

VIEWS

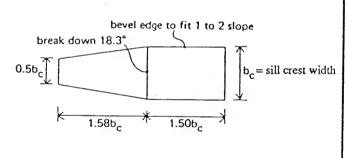
LONGITUDINAL SECTION

END VIEW





TOP VIEW SILL DETAIL



100 mm Flume	200 mm Flume
$b_c = 100 \text{ mm}$	$b_c = 200 \text{ mm}$
= 3.94 in	= 7.87 in

Prepared for:

U.S. Army Program Manager for Rocky Mountain Arsenal Commerce City, Colorado

Prepared by:

R.L. Stollar & Associates, Inc. Riverside Technology, Inc.

Figure A-2.1-1

100mm and 200mm Long-Throated Flume Specifications

CMP SW FY89

Appendix A-2.1

Table 2.1-1 Stage Discharge Relationship for 100 mm Portable Long-throated

h (ft)	Q (cfs)	
0.04	0.0078	
0.05	0.0113	
0.06	0.0153	
0.07	0.0198	
0.08	0.0247	
0.09	0.0301	
0.10	0.0360	
0.11	0.0424	
0.12	0.0492	
0.13	0.0565	
0.14	0.0643	
0.15	0.0726	
0.16	0.0814	
0.17	0.0907	
0.18	0.1004	
0.19	0.1107	
0.20.	0.1214	
0.21	0.1327	
0.22	0.1445	
0.23	0.1568	
0.24	0.1697	
0.25	0.1831	
0.26	0.1970	
0.27	0.2114	
0.28	0.2264	
0.39	0.2420	
0.30	0.2582	
0.31	0.2748	
0.32	0.2921	
0.33	0.3099	
•		

⁽¹⁾ Design and ratings taken from "Flow Measuring Flumes for Open Channel Systems"; Marinus G. Bos, John A. Repogle, Albert J. Clemmens, 1984 by John Wiley & Sons, Inc.

^{(2) &}quot;h" is upstream sill - referenced head.

Appendix A-2.1

Table 2.1-2 Depth Discharge Relationship for Long-throated Portable Flume with 0.66 ft (200 mm) wide sill (1)

h (ft)	Q (cfs)	h (ft)	Q (cfs)
0.07	0.0367	0.37	0.6008
0.08	0.0456	0.38	0.6303
0.09	0.0552	0.39	0.6606
0.10	0.0655	0.40	0.6915
0.11	0.0765	0.41	0.7232
0.12	0.0883	0.42	0.7557
0.13	0.1007	0.43	0.7887
0.14	0.1137	0.44	0.8226
0.15	0.1275	0.45	0.8572
0.16	0.1419	0.46	0.8927
0.17	0.1570	0.47	0.9288
0.18	0.1727	0.48	0.9656
0.19	0.1891	0.49	0.9656
0.20	0.2062	0.50	1.042
0.21	0.2240	0.51	1.081
0.22	0.2424	0.52	1.121
0.23	0.2615	0.53	1.161
0.24	0.2813	0.54	1.203
0.25	0.3017	0.55	1.245
0.26	0.3229	0.56	1.288
0.27	0.3447	0.57	1.332
0.28	0.3672	0.58	1.376
0.29	0.3903	0.59	1.422
0.30	0.4142	0.60	1.468
0.31	0.4387	0.61	1.515
0.32	0.4640	0.62	1.563
0.33	0.4900	0.63	1.611
0.34	0.5167	0.64	1.661
0.35	0.5440	0.65	1.711
0.36	0.5721	0.66	1.762

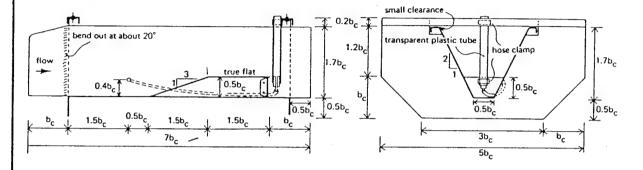
⁽¹⁾ Design and ratings taken from "Flow Measuring Flumes for Open Channel Systems"; Marinus G. Bos, John A. Repogle, Albert J. Clemmens, 1984 by John Wiley & Sons, Inc.

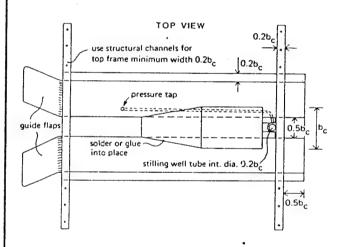
^{(2) &}quot;h" is upstream sill - referenced head.

VIEWS

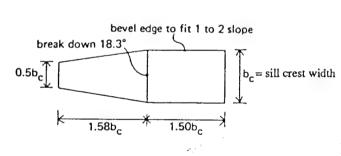
LONGITUDINAL SECTION

END VIEW





TOP VIEW SILL DETAIL



100 mm Flume	200 mm Flume
$b_c = 100 \text{ mm}$	b _c = 200 mm
= 3.94 in	= 7.87 in

Prepared for:

U.S. Army Program Manager for Rocky Mountain Arsenal Commerce City, Colorado

Prepared by:

R. L. Stollar & Associates, Inc. Riverside Technology, Inc.

Figure A-2.1-1

100mm and 200mm Long-Throated Flume Specifications

CMP SW FY89

APPENDIX A-2.2

Discharge Measurement Procedures

A-2.2 Pygmy and Type-AA Current Meter Discharge Measurement Procedure

The following details procedure methods used in performing an instantaneous discharge measurement using pygmy or Type-AA current meters.

The calibration check for the Pygmy and Type-AA current meters are as follows:

- the rotor and shaft alignment was checked by spinning the bucket wheel;
- the cups were checked for damage and bending;
- the Type-AA tailpiece condition was checked; and
- a spin test was performed to check the condition of the bearing and record. A normal Type-AA meter spin test should never have been less than 1 1/2 minutes. The normal spin for a Pygmy meter should never have been less than 1/2 minute.

The Marsh-McBirney current meter is a factory calibrated electromagnetic-type meter and cannot be adjusted in the field. However, the battery, the electromagnetic sensor and internal electrical circuitry was checked. In addition the above field inspection procedures, each meters' manufacturer suggested instructions for routine care and maintenance was followed.

The following procedures were implemented to measure and calculate current meter instantaneous discharge rates:

- A measuring tape was stretched across the stream at right angles to the direction of flow to determine the width of the stream and to be used in the measurement of each flow cell.
- The spacing of the subsections (flow cells) was generally made by dividing the total width of the stream into 20 subsections. Sections were usually chosen so that no section contained more than 10 percent of the total flow. Equal widths (subsections) across a cross section were used unless the discharge was well distributed. For RMA where 20 sections were not usually possible a minimum distance of 0.3 feet between subsections was generally used.
- Recording stream stage from the staff gage and the recorder (if present). Identifying the starting point by either LEW or REW (left edge of water or right edge of water, respectively, when facing downstream). Recording the starting time on the

measurement sheet and on the recorder (if present). Recording the staff gage periodically during measurement and time in order to determine the mean gage height for the measurement.

- Recording the distance from the initial measuring point to the edge of water and the depth at the edge of water.
- For stream depths encountered during WY88, measurements were made at 0.6 depth using a top setting wading rod. This rod is masked so as to automatically suspend the current meter at 0.6 depth by "setting" the total depth on the wading rod.
- After the meter was set at the proper depth, it was allowed to stabilize to the stream current. The wading rod was kept in a vertical position and the current meter was held parallel to the direction of flow. The hydrologist stood in a position that least affected the velocity of the water passing the current meter by standing downstream and off to one side of the rod.
- The measuring and recording of flow velocity using the Pygmy or Type-AA meters was performed in accordance with the manufacturer's instructions. The minimum time for measuring velocity in each subsection was 40 seconds. A headphone set was wired into the meters and a click was heard in the headphones that corresponded to each meter revolution. The number of revolutions was recorded for each 40 second time interval. The velocity for each subsection was either calculated or obtained from the meter manufacturer's table for the numbered revolutions per 40 seconds. Marsh-McBirney meter measurements were obtained from the direct digital display on the instrument.
- The remaining stream flow measurement was obtained by moving to each of the verticals and repeating the process. Upon completion of the measurement the time and bank where the section ended and the stream staff gage and recorder water level was recorded on the discharge measurement sheet.
- The description of the stream bed, flow conditions, location of the measurement, weather and any other pertinent information which may have affected the accuracy of the measurement or the stage discharge relationship was recorded on the discharge measurement sheet.
- A field calculation that added the section widths, totalled the section widths and computed the discharge was performed.

Long-Throated Flume Discharge Measurement Procedure

Instantaneous discharge measurements are taken using either the 100mm or 200mm long-throated flumes depending on stream stage and flow conditions. The 100mm flume is capable of measuring flows ranging from 0.0078 cfs to 0.3099 cfs, and the 200mm flume is capable of measuring flows ranging from 0.0367 cfs to 1.762 cfs.

Both flumes are custom built, galvanized sheetmetal rated structures. A water intake port in the flume channel is hydraulically connected to a clear plastic stilling well that is attached to the structure. The water level in the flume channel is measured as hydraulic head in the stilling well. The structures are mathematically rated, which enables a conversion of the measured hydraulic head to a corresponding discharge.

Procedures for obtaining instantaneous discharge measurements with either the 100mm or 200mm long-throated flumes are as follows:

- Select a site in the channel for the flume. This site should be in a reach of the channel that is straight both upstream and downstream of the flume site. The channel should be free of obstructions and have uniform flow.
- Record gage height (if available) and time in the log book and on the data sheet.
- Prepare the channel at the flume site by removing any rocks or debris which will interfere with leveling and sealing of the flume during installation.
- Install the flume in the channel making sure the flume is stable and level. Leveling of the cross-slope and longitudinal slope may be done with a carpenter's level.
- Seal the bottoms and sides of both the upstream and downstream faces of the wingwalls of the flume with soil. The flume must be completely sealed so that all flow is diverted through the flume for an accurate measurement.
- Allow the flow to stabilize over the sill of the flume. Check for leaks around the edges and bottom of the flume and seal if necessary.
- Obtain the sill-referenced head by measuring the distance from the top of the sill to the water level inthe stilling well with a metal tape measure.
- For each size of flume, a rating table was prepared (see stage discharge relationship

tables). Using the proper rating table, find the h value, in feet, and record the corresponding discharge value, in cfs. The head, discharge, time and gage height (if available) are recorded in the log book and on the data sheet. Generally, there are three discharge measurements taken at five minute intervals at each site.

APPENDIX A-2.3

1989 Water Year Instantaneous Discharge Measurement Records WY89 Discharge Measurements Summary

APPENDIX A-2.3 TABLE A-2.3-1
SUMMARY OF DISCHARGE MEASURMENTS FOR MONITORING STATIONS

SITE ID#	SITE NAME	DATE	INSTRUMENT TYPE	DISCH (CFS)	STAGE (FT) START/STOP	COMMENTS LOCATION
sw01001	N. UVALDA	89269	FLUME-100MM	0.03	0.19	STAGE CONVERTED TO DISCHARGE
sw02006	STEAM PLANT	89117	FLUME-200MM	0.34	NA	EVEN WITH SURVEY STK
	EFFLUENT	89167	FLUME-100MM	0.09	NA	EVEN WITH SURVEY STK
		89201	FLUME-100MM	0.06	NA	EVEN WITH SURVEY STK
		89270	FLUME-100MM	0.11	NA	10FT UP STAKE
sw07001	UVALDA DITCH A	89268	FLUME-100MM	0.06	NA	
sw07002	UVALDA DITCH B	89268	FLUME-100MM	0.17	NA	
sw08001		89272	FLUME-100MM	0.14	NA	1100' ABOVE SW08003
รเกลกกร	S FIRST CREEK	, 89097 PYG	CURRENT METER	0.59	0.49	25FT BELOW GAGE
3#00003	5 TIKST CKEEK		CURRENT METER	1.06	0.58/0.57	
		89115	FLUME-200MM	0.72	0.47	40FT BELOW GAGE
		89123	FLUME-200MM	0.86	0.50	40FT BELOW GAGE
		89125 PYG	CURRENT METER	9.23	1.23/1.22	40FT BELOW GAGE
		89134	NA	6.40	1.10	CALCULATED FROM STAGE
		89171	FLUME-200MM	0.69	0.48	30FT BELOW GAGE
		89201	FLUME-100MM	0.01	0.13	30FT BELOW GAGE
		89269	FLUME-100MM	0.10	0.22	30FT BELOW GAGE
*		89272	FLUME-100MM	0.06	0.20	30FT BELOW WEIR
sw08004		89272	FLUME-100MM	0.04	NA	1400'BELOW SW08003
0.144004		90117	ELLINE 200MM	0.13	0.72	30FT BELOW WEIR
SW11001	PEORIA INT	89116 89134	FLUME-200MM NA	14.01		CALCULATED FROM STAGE
		89201	FLUME-200MM	0.16	0.69	
		89270	FLUME-100MM	0.05	0.70	
sw11002	HAVANA INT	89101 PYG	CURRENT METER	1.46	0.52/0.51	8FT DWNSTR BUBBLER
J. 1. 1. 0. 0 L.			CURRENT METER	0.37	0.25	
		89130	NA	20.87		CALCULATED FROM STAGE
		89201	FLUME-200MM	0.37	0.23	END OF CONC CHANNEL
		89270	FLUME-200MM	0.49	0.25	END OF CONC CHANNEL

APPENDIX A-2.3 TABLE A-2.3-1
SUMMARY OF DISCHARGE MEASURMENTS FOR MONITORING STATIONS

SITE ID#	SITE NAME	DATE	INSTRUMENT TYPE	DISCH (CFS)		
sw12001	UVALDA DITCH C	89110 P 89268	PYG CURRENT METER FLUME-200MM	0.33 0.27	NA NA	
sw12005	S. UVALDA		YG CURRENT METER	0.26	3.85	
			YG CURRENT METER	0.30	3.85	
			YG CURRENT METER	0.35	3.80	
		89111	FLUME-200MM	0.26	3.84	30FT BELOW GAGE CALCULATED FROM STAGE
		89130	NA FLUME-200MM	4.53 0.54	4.58 3.88	
		89269	FLUME-200MM	0.30	0.51	
		89272	FLUME-200MM	0.17	0.50	
sw12008		89272	FLUME-200MM	0.11	NA	.41MILES BELOW 12005
sw12009		89272	FLUME-200MM	0.10	NA	.90MILES BELOW 12005
sw24001	SEWAGE PLANT	89138 89270	NA/VOLUMETRIC NA/VOLUMETRIC	0.01 NA	NA NA	END OF PIPE VARIABLE FLOW
sw24002	N FIRST CREEK	89111 P 89123	PYG CURRENT METER PYG CURRENT METER FLUME-200MM PYG CURRENT METER	0.32 0.31 0.79 3.35	0.46/0.47	55FT BELOW GAGE 30FT BELOW GAGE
sw24004	FIRST CREEK NORTH BOUNDARY	89114	FLUME-200MM	0.14	NA	
sw30002	FIRST CREEK AT NORTH PLANTS	89114	FLUME-200MM	0.46	NA	
sw36001	BASIN A	89271	NA-VOLUMETRIC	0.02	0.11	END OF DISC PIPE

APPENDIX A-2.3 TABLE A-2.3-1
SUMMARY OF DISCHARGE MEASURMENTS FOR MONITORING STATIONS

SITE ID#	SITE NAME	DATE	INSTRUMENT TYPE	DISCH (CFS)	STAGE (FT) START/STOP	COMMENTS LOCATION
sw37001	FIRST CREEK OFF-POST	• • • • • • • • •	CURRENT METER CURRENT METER FLUME-200MM FLUME-100MM	0.29 0.31 0.54 0.02	0.51 0.52 0.58 0.58	40FT ABOVE FLUME 30FT ABOVE GAGE 40FT ABOVE FLUME 10FT BELOW FLUME

NA - NOT APPLICABLE
PYG - GURLEY 625 PYGMY CURRENT METER

WY89 Discharge Measurement Field Records

DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

METER TYPE
SPIN BEFORE MEAS. N/A AFTER NA RATING
MEAS. PLOTS N/A % DIFF. FROM N/A RATING
WADING, UPSTR), DOWNSTR., SIDE BRIDGE 15 FEET, MILE, (ABOVE) BELOW GAGE, AND MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION AIR \(\sigma^2 \in \frac{\pi}{\sigma}\) \(\frac{\pi}{\sigma}\) \(\f WEATHER PARTY CLOWDY W75"F G.H. CHANGE 5,0010015 RECORD REMOVED 5£14 STATION NAME NORTH LIYALDA METHOD LEGIND FILING NO. SECS low, uniform GAGE SING TYPE C MEASUREMENT NO. COMPILED BY CHECKED BY 27/15 DATE WIDTH OTHER FLOW 69258

z

G.H. OF ZERO FLOW REMARKS

Censent Y notch wain

CONTROL

OBSERVER

님

	OUTSIDE	0					
	H	\vdash					
	R INSIDE						
SDNIC	RECORDER						
GAGE READINGS							
		-					
	TIME	37				D M.G.H.	D MG.H.
	F	7611				WEIGHTED M.G.H.	WEIGHTED M.G.H.

a Discharge		(1)300		THE FLUE															-
ity Area		73		CCSSCHIT	d														
in ds Velocity	11	いいろうだくごと		TON DE	ACMONTO A														
Time in Seconds	13	2011		A BENCHE	Calca A														
Revolutions	1 - facor 1	12 24 65 1	1. wm. 6	SOFT	2)										.				L
Depth		<u>स्ट</u> ाउटेट्स	17 52	10 Jx	Jun 1 1 2														
Width	3)		5/6/1	بهثبا	Course														
Distance from Initial Point			1155	1335												-			

FOPM31 / DEC 87

009/0 @ 1620 START FINISA Distance from Initial Point

DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

(5000000) DISCH. HRS. 427 ,19 89 PARTY JR, LB, KH
AREA VEL. G.H. DISC Z G.H. CHANGE NA PLANTS STEAM EFFLUENT AFTER NA 413 LONG THEOMED FLAME NO. SECS METER TYPE W.A.A. SPIN BEFORE MEAS. W.A. MEAS. PLOTS WADING, UPSTR., DOWNSTR., S. STATION NAME SOUTH 21112 MEASUREMENT RATED FOLLOWING CONDITIO MEASUREMENT NO. COMPILED BY CHECKED BY FLOW LOW - UN NUNE METHOD GAGE DATE WIDTH OTHER

100

MEAS. PLOTS MEAS. % DIFF FROM	DATING			17118 10 101	7 7
WADING, UPSTR., DOWNSTR., SIDE BRIDGE	FEET,	MILE, ABOVE, B	FEET, MILE, ABOVE, BELOW GAGE, AND	-	
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	(5%), FAIR (8%), POOR (OVER	8%), BASED ON	1 30/ el 10/	. 630
FLOW LOW - UNIFORM WEATH	HER doc	ol, CLOUR	WEATHER GOOL, CLOUMY, LT WIND	Total	
ОТНЕЯ	AIR	55 F®	1500	10/46	6.91
GAGE NUNE INSTALLED	WATER	WATER 65 OF 1500	005/	01 30	L/7
RECORD REMOVED	NA	_ INTAKE FLUS	U NTAKE FLUSHED L NA	7	
OBSERVER					
CONTROL NO CONTRUC INSTALLED	NSTALLE	0			
REMARKS		The state of the s			
G.H. OF ZERO FLOW			1		
GAGE READINGS	DINGS				
TIME	RECORDER	INSIDE	OUTSIDE		
WEIGHTED M.G.H.					
G.H. CORRECTION					
COURTING					

FOPM31 / DEC 87

CORRECT M.G.H.

Discharge Area FLUME Velocity THROATEU Time in Seconds .900 Revolutions 5N07 1486 Depth USED 30 de Width

DISCH. 0.0907 RATING FEET, MILE, ABOVE, BELOW GAGE, AND MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION HRS. INTAKE FLUSHED L NA WEATHER WARM, SURROY, No WIND 1125 500 BD 006 40 1125 ୍ଜ ଓ G.H. CHANGE NA AIR 80° WATER 265 " G.H. DA STEAM EFF PARTY NA VEL RECORD REMOVED_ 7 METER TYPE N.T.
SPIN BEFORE MEAS. N.A. AFTER N.A.
MEAS. PLOTS % DIFF. FROM
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 19 89 RANB 04/07 6/16 1.5' AREA 100 MM FLOMS GAGE NOWE INSTALLED FLOW LOW-UNIFORM STATION NAME SOUTH 4.7 MEASUREMENT NO. COMPILED BY CHECKED BY OBSERVER METHOD OTHER WIDTH DATE

G.H. OF ZERO FLOW				ET
	GAGE RE	GAGE READINGS		
TIME		RECORDER	HINSIDE	OLITSIDE
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

FOPM31 / DEC 87

	(\$	19/6870																			
Discharge	1 1	12/	116																			
Area		PETABLE	0.78						C	7		2										
Velocity		ATU 12	- 4							7184		7	_									
Time in Seconds	#1/4	14101	PLACE						1	1		000								-		
Revolutions		40107	IN ;	0.17		2.7	0.17		- 1	5 1 1			3						ţ			
Depth		272	OME	7 4	,	7 1	11		0,1	120	(1	7									
Width		2/6	17-9	30,	\ \	5	30 -		1001	VAL												
Distance from hittal Point	100	7 724		///		119																

INSTALLED

JONTROL

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CONTROL

COMPILED BY	Dista
CHECKED BY	Initia
STATION NAME - 7 STEAM EXT	
DATE \$9201 7/20 19 89 PARTY TO OF DISCH (1056)	
`	13,1
114	
SPIN BEFORE MEAS. A.A. AFTER AFTER A.B. MEAS. PLOTS A.A. WIFE. FROM BATING WADING, UPSTR., DOWNSTR., SIDE BRIDGE FET, MILE. ABOVE. BELOW GAGE AND	5
Control of the contro	Ì
MEASUREMENT HATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	5
FLOW LOW - UNIFORM WEATHER WARM, SUNNY	۲
ОТНЕЯ 90 4® 1530	
GAGE NUNE ANSTALLED WATER 70 OF 1530	M
RECORD REMOVED NA INTAKE FLUSHED L NO	
OBSERVER	

		L.		OUTSIDE						
	OINT			INSIDE						
0377	4 37dWA		GAGE READINGS	RECORDER						
INSTAL	N AT 5,		GAGE RE							
ONE	TAKE	MC							z	
CONTROL WONE INSTALLED	REMARKS Q TAKEN AT SAMPLE FOLKT	G.H. OF ZERO FLOW		TIME				WEIGHTED M.G.H.	G.H. CORRECTION	

FOPM31 / DEC 87

Discharge	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Area	1.00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2
Velocity		
Time in Seconds	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	059
Revolutions	100 M 10-11 0-13	
Depth		D D
Width		
Distance from Initial Point	1527 1830. 1535 1546 1546	

MEASUREMENT NO. COMPILED BY CHECKED BY	729				Distance from Initial Point
STATION NAME SON OS COC	000				
DATE 57272 9/2	4/27 ,19 89 AREA V	PARTY ZZZ 1 UEL. G.H.	64 118	6.0% DISCH-1/0?	100
METHOD LEVER ON SECS	SECS	G.H. CHANGE	NGE	IN HRS.	
METER TYPE SPIN BEFORE MEAS. MEAS. PLOIS. "* DIFF. FROM WADING, UPSTR. "> DOWNSTR., SIDE BRIDGE	AFTER % DIFF. FROM STR., SIDE BRIDGE	RATING	S. MLF, ABOVE, B	TING STANK STANKE STANKE	# 1
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	LENT (2%), GOO OSS SECTION	D (5%), FAIR (8%), POOR (OVER	8%), BASED ON	
FLOW/_c?er>	WEA	WEATHER 18 1	10/0		# 3
ОТНЕЯ		AIR	\$ 0 H	133C)	
GAGE KONE INST	1/20 /	WATER	%		
REC	RECORD REMOVED		L INTAKE FLUSHED L	HED L	2/3/
OBSERVER					Tep
CONTROL L'AME IN	15tolle	5			70 te
REMARKS / Se // Se	Serves				
G.H. OF ZERO FLOW				1	
	GAGE READINGS	ADINGS			
TIME		RECORDER	INSIDE	OUTSIDE	

,	1 (1 1		, ,	1 1		,	1		. Qi.	١							
Discharge								15/2	18/	11 /4/6								
Area	3		1320	1325		1330		Se	C	7),(
Velocity								xe x	P.S.I	0								
Time in Seconds	/0/	,		11/67		11167		efore	0 02	0		,25,	,6/.	71				
Revolutions	7000							C. F. C.	12	4		"	5 2	6//				
Depth	inc +	(J. 7. 1)	6/.	6/,		61.		35+1	Tu Se	24.6		2,2	7	1,6/				
Width	7,4,0							1	20	de		,5	8%,	11				
Distance from Initial Point	100	-	#	14		X 3		10/2	40	70 te					•			
		, ^,		₩ ⊆)										 		 	

FOPM31 / DEC 87

WEIGHTED M.G.H. G.H. CORRECTION

CORRECT M.G.H.

COMPILED BY CHECKED BY		Distance from Initial Point
STATION NAME SCOZEC/		100
DATE SSECS 9/25 19 85 PARTY 5.G. G332 J.G. WIDTH AREA VEL. G.H. DISCH., C. G.	0	
G.H. CHANGE	HRS.	17
METER TYPE SPIN BEFORE MEAS. AFTER AFTER MEAS. PLOTS SIDE BRIDGE ADDRES, BELOW GAGE, AND	E, AND	# #
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	NO O	X
FLOW LOSE WAS FOR WEATHER CLOCK WORK		
OTHER AIR 75 #@ /C / 6		10/2
GAGE LONE. WATER 12,9 oF C S. S.	~	+
CE FLUSHED L		10,0
OBSERVER		10-X2
CONTROL Les 105/2/100/		
REMARKS (EL) Som place - Thinge 10 xelle	:	
Aucht Lines of John John Schened prise	V 1	
GAGE READINGS	-, [
TIME RECORDER INSIDE OUTSIDE	T _u	
	1	

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FOPM31 / DEC 87

WEIGHTED M.G.H.

CORRECT M.G.H.

MEASUREMENT NO. COMPILED BY CHECKED BY				Distance from Initial Point	Width	Depth
STATION NAME SUCO 2002				100	non	1/20
DATE 2/25/89 87268,19 87 WIDTH AREA V	PARTY GRO VEL. GH	00 70 GH 1616	SCH. Mask	*		4
WETHOD FLOOR BECS	G.H. CHANGE		IN HRS	n		1 1
METER TYPE SPIN BEFORE MEAS. AFTER				#2		,24
% DIFF.	RATING FEET, I	MILE, ABOVE, BI	NG FEET, MILE, ABOVE, BELOW GAGE, AND	E # 3		12.61
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	(5%), FAIR (8%), POOR (OVER	8%), BASED ON			
FLOW Con WEATHER	HER CLEAR	۲.				
ОТНЕЯ	AIR	75. F@	1/20	70 to	1	145
GAGE	WATER	9F.09				5
RECORD REMOVED		INTAKE FLUSHED	HED L	750	2.f. 70	Se X
OBSERVER						
				Total	1	7 7 7
CONTROL Mone Installed					3	
REMARKS L'a Station	tall	Samo	J'en ;		V 11	'9
G.H. OF ZERO FLOW			111		2/2.	7
GAGE READINGS	SDNIC			The same and of their fines to the same of the same	125	,24,
TIME	RECORDER	INSIDE	OUTSIDE			
WEIGHTED M.G.H.						
G.H. CORRECTION						

1 .		1		1	1	1	1-1	111	1	1 1	ı	1 1	f		1	1 1	ı	ı	1		1	1
Discharge	_1						6															
Агеа	1 1	20//	1 2	1105	1110		11 10	45					5									
Velocity			9890		Book H		0 7 00	(1		0 0			9 9001	45								
Time in Seconds	C.P.c	1569	1697	1000	5/26/		Sere in	c.A.s.		0 11	, 52	25	697 198	D-3/1								
Revolutions	2						of ve	det :		J-	, a	11	1	= - 14								
Depth	5/1913	52		157.	15:21		reth	, Se X		244	5.6	2, -		,24,								
Width	wu						1/6	2 F 70		de	,5,	8/2.		12 5.								
Distance from Initial Point	100	1#	3	11	F3		10 16	Tip		Total												
		ds	Z.B		0																-	

FOPM31 / DEC 87

CORRECT M.G.H.

	_
MEASUREMENT NO. $\begin{array}{c c} \hline & \hline & \hline \\ \hline \\$	Dist
DATE 89272 9/27 19 89 PARTY G PO TG WIDTH 700 AREA VEL. G.H. Long DISCH 1/4	1 1
100	
METER TYPE SPIN BEFORE MEAS. AFTER MEAS. PLOTS. % DIFF. FROM RATING WADING. UPSTR., SIDE BRIDGE FEET, MILE (ABOYE; BELOW GAGE, AND	1 1 14
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	4 6
FLOW 1622 Charter WEATHER Cheery LUCANON	
OTHER AIR & TE® 1/55	- I
GAGE WATER 15.2 9 P. 1155	1
RECORD REMOVED INTAKE FLUSHED L	1,1
OBSERVER	1, 1
CONTROL L'ENC	-
REMARKS (Town / Lass inconsenced - Fill Singling	1 [
Suspended Srel. Sangle tallen.	
G.H. OF ZERO FLOW	1
GAGE READINGS	1

						ı		1 1	1	ı	1 1	. 1	\ I	1	1	1	1	1	1 1	1	1	1	í			-	1
Discharge									6		1 20/1		, 52.														
Area			11/20	54/1		08//	5511		0		= //		11														
Velocity									int or		A SU		74,50			(4)		o Fr									
Time in Seconds		(CHS	5561		5/1/1/5	144		2000		Xess a	2	50 10	, , , 0		.22,	1	Shh.									
Revolutions	une								of t		X		4	i	. (11 97		11									
Depth	1	\	11	22.		.22	,22	1 1	44		Fub		420	201		18-)	. S.									
Width	m w										Sp		1 de		2	,		7									
Distance from Inital Point	100			1#	,	#2	* 3		10%		700	2	10 to														

OUTSIDE

INSIDE

RECORDER

TIME

WEIGHTED M.G.H. G.H. CORRECTION

CORRECT M.G.H.

DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

PART - FIRST -

LAR

7.4. 28,8

MEASUREMENT NO. COMPILED BY CHECKED BY

WY89 # 84 PB 68102

AREA 2872 VEL. 300 GH . 79 DISCH. 594 NEW SOUTH FIRST UPLET SUUBOUS Ø METHOD METER NO. SECS 20 4-4 STATION NAME DATE WIDTH

PYEMY CHRAINT METER METER TYPE GUNCLON FOR 625 PYGOTY CURRENT MARTEN BRING SPIN BEFORE MEAS. STEP ON BATING MADING, UPSTR., BOWNSTR., SIDE BRIDGE 25 CEEL MILE, ABOVE, BELOW GAGE, AND

IN CO HRS.

G.H. CHANGE

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

16871

OKERTE - SO F@ 1130 PARTLY CLOUBY LOW- MODINGATINE WEATHER PARTLY DEPARTMENTS SOW UNSTATION AIR TO GAGE OTHER FLOW

INTAKE FLUSHED L AND 130 °F@_ 25 WATER Ş RECORD REMOVED STAFF - GOOD COND

OBSERVER

- 15' UPSTIDEAM V- NOTCH CONTROL

BANTS

ON 12 MZ. H. SIDE TO IMPPONIE FLUND. CHMWNEL STABLE FLUND CHUNDEL STABLE FLUND CHENDS UPSTABAM GH. OF ZERO FLUNDSTREMM OF Y-SBERGEN FOR 7 ノとなどし BUILT INTOWARDS REMARKS

64.0 OUTSIDE 64.0 64.0 0.49 INSIDE RECORDER 0.49 0.49 0.49 0.49 GAGE READINGS G.H. CORRECTION 1209 WEIGHTED M.G.H. CORRECT M.G.H. 1130 カカニ TIME

								(-													١						
Discharge	0 000	0000	0057	0,049	1,40.0	2400	0.046	0,046	0.086	0.000	0.050	0,000	0.007	0.055	8.029	0.000	0.044	0.03/	0.000	0.000		465'					
Агва	200	0,144	0,172	0.1184	0.156	-	0,152	0.176	17	0,192	0, 188	261.0	0.308	4810		0.167	0.148	0,132	0.054	0.000			\	2,973			
Velocity	0.00	0.000	0,333	0.300	0,366	0,266	0.300	0,333	5800	0.033	0.266	0.133	0.033	0.300	0.167	0.367	0,300	0,233	0.000	0,000			age 0				
Time in Seconds	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	90	30							
Revolutions	0	0	01	6	8	8	6	11	/	/	<i>9</i> 0	1	/	6	6	11	6	7	O	0							
Depth	51.	,36	,43	.41	.39	.42	.38	77.	.43	. 48	. 44	. 48	,52	. 46	44.	14	.37	. 33	8/8/01/8	03.60							
Width	.2	4.	+	1	7,	4.	4.	4.	ή,	4.	4	7.		Entrof 4	•	+ -	<i>t</i>	1,	34.5	2 × 0							
Distance from Initial Point	7.4	х ,	3, 2	3,6	4,0	4.4	4.8	215	5.6	6,0	ナシア	8	7,2	4. B.	3,0	4.8	2.3	9,2	9.6	9.8							

UPSTREAM

DISCHARGE MEASUREMENT NOTES

R. L. STOLLAR & ASSOCIATES

WIDE 17.8

0.039

123 0,350 0.375 350 0.275 0.250 0,000 0.325 0,250 0.325 0.350 0,300 0.325 0.7.0 0.250 0.875 0.275 0.250 0.450 0.450

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RECORD REMOVED

OBSERVER

of@ 1536

45

WATER

GAGE

STAFF

GAGE

4@ 1536

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Time in Seconds 40

Depth

Width

Distance from Initial Point

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3,20

DISCH. 1.064

3.612 VEL. . 395 G.H.

AREA AREA

APRIL

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FIRST

SOUTH

STATION NAME

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MEASUREMENT NO. COMPILED BY CHECKED BY

IN/.5 HAS.

G.H. CHANGE

40

FLOW METERNO, SECS

METHOD

WIDTH

DATE

144 150 153 1,135 , (56 6515 0.250 0.275

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5.5

5

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3 30

4.40 4.70

METER TYPE CURLEY # 625 PYCMY CURRENT NO.; NN 63489 MEAS. SO AFTER PATING MEAS. PLOTS WDIFF, FROM MEAS. PLOTS WADING, UPSTR, DOWNSTR, SIDE BRIDGE #3 (FET) MILE, ABOVERBELOW GAGES AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION_____

TO MODERATE WEATHER SUNNY LIGHT WIND

LOW

OTHER FLOW

40

3

Revolutions N

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AOUATIC GROWTH

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LEMENT CONTROL

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101-20

G.H. OF ZERO FLOW

TIME 1536 1536 1627 1647

TUMBLEWEEDS AND

REMARKS REMOVED

UPSTREAM

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CONCRETE

CONTROL

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OUTSIDE

INSIDE 4 to be

RECORDER

GAGE READINGS

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G.H. CORRECTION **WEIGHTED M.G.H.**

CORRECT M.G.H.

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1035 - Measurement teles

MEASUREMENT NO. COMPILED BY CHECKED BY	Distance from Initial Polnt	Width	Deoth	Revolutions
STATION NAME SOUTH FIRST CLUSTER (SWOROOS)				
4/25 19 84 PARTY JK RA JUSCH			1	
VGE Ø			*/	A B
MEAS.		77	7-	188
MEAS. PLOTS WADING, UPSTR. (BOWNSTR.) SIDE BRIDGE A FEET) MILE, ABOVE, (BELOW GAGE) AND		-	~	8
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION		A =	5.	3
FLOW LINIFORM WEATHER SUINNY, BREEZY				
OTHER 70 5 + © 15				
GAGE CLEAR WATER 64 OF 1015				
RECORD REMOVED YOUR INTAKE FLUSHED L NO				
OBSERVER C				
CONTROL CLEAR				
REMARKS Sumpled Spring at some				
, in the second of the second				
G.H. OF ZERO FLOW				
GAGE BEADINGS				

	OUTSIDE	0 10	047	0 40	1.5.1				HY V	7.4.0
	INSIDE									
 GAGE READINGS	RECORDER	0,4	0.47	00 9	-				V11 0	U.47
GAGE RI		BEFORE	12 TATES	AFTER						
	TIME	1000	1035	1042			WEIGHTED M.G.H.	G.H. CORRECTION	CORRECT MGH	

)																
Discharge				2	646																	
Area					nen																	
Velocity			_		76 4	5																
Time In Seconds	1	\ !	7 =		10 ×																	
Revolutions	7	4	149)	k	3																	
Depth		*/) - (0		.4												-					_
Width		,	51)	-	T V																	
Distance from Initial Point																						
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FT		OITSIDE	0.50	0.50	0.50	0 60	0,50			0.00
		INSIDE	1							
	GAGE READINGS	RECORDER	07.0	0.50	0.50	0.60	05,0			0,50
	GAGE RE		BEFORE	Dureine	=	11	4F7ER			
G.H. OF ZERO FLOW		TIME	5160	0060	0 63 6	0860	0935	WEIGHTED M.G.H.	G.H. CORRECTION	CORRECT M.G.H.

					Looks GOD														
Discharge					Looks														
Area	00	70	98	ļ	186														
Velocity	ı		0 =		0														
Time in Seconds		-	0 ;;		0,,				0.XC							-			
Revolutions	AA		,45		64,			6	1 5							-			
Depth	11		0	- 1	0 11				FINAL										
Width	101	1	h(2)	, ,,,	7(2)				+										_
Distance from Initial Point	0400		0925	100	8430														_

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CONTROL

REMARKS CHECK ING

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G.H. OF ZERO FLOW_

DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

(xw=14.5 STAT 1051 PEW - 19 END 1108 LEW = 19 ∞ ≥ 3 BE

Discharge

Area

Velocity

Time in Seconds

Revolutions

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the t 00. ů O J. 00,1 000 127 100 .0x Depth 200 80 50 00 20 50 20 2.0 50 20 20 50 ,50 50 Distance from Initial Point 4.0 0 0 K 33 A. N. 5.0 6.0 0.0 7.5 S PATING Z FEET MILE, ABOVE, BELOW GAGE AND SUNNY BREEZY 20 HRS. MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION (020 1020 (5008003) DG. DISCH. INTAKE FLUSHED L SER # NN6349 °F@ FOR UNKNOWN PENSONS SF CONTROL C S HIN E C G.H. CHANGE FLOW HIGH - NOW UNIFORM WEATHER WAR KM S 18 10 WATER S PARTY CREEK METER TYPE 6 URLEY 4625 PY 6MY
SPIN BEFORE MEAS. 40 AFTER 42
MEAS. PLOTS
WADING, UPSTR, DOWNSTA SIDE BRIDGE 402 VEL. DNSTRM BROWATER DOVG GREW - RIC e 61 CEMENT DOUTH FIRST GOOD SHARE RECORD REMOVED 18/2 NO. SECS AREA 1 - NOTCH CLEANED SAGE OUT HIGH KLOW 57168 OTHER SOME ECOSE MEASUREMENT NO. COMPILED BY CHECKED BY G.H. OF ZERO FLOW GAGE STATE STATION NAME OBSERVER REMARKS CONTROL METHOD WIDTH DATE

									7	~	3	ų	1	(1)			
1.535 W 8 CV17	A.F.O	457	36	386	3717	3/5	24.9	140	0341 BW	017 20		Lanz	10 18	a profit			
S / W	.31	,29	395,	,315	1335	350	1375	380	340	,093							
1.525	1.775	1,5R	562' 522'	5/21/522/	1.124 1335	,900	,65	,375	201,	725							
4	40	40	40	40	40	40	40	40	40	40							_
9	16	59	4	9	45	36	36	15	4	7							-
C	195	,58	15%	63	67	. 70	. 75	. 76	89.	,34					-		-
200	.50	150	,50	,50	,50	.50	09.	,50	150 m	20.25							-
200	10.0	10.5	11,0	11.5	12.0	12.5	13.0	13.5	14.0	14.5							-
	1	- 3	<u>w</u>	2	200	W.	4	4	43	157	Т		T	T	T		•
					ш	1	با	ا ب		_	1	1					

OUTSID

INSIDE

RECORDER

GAGE READINGS

23 200

23

なため MID

> G.H. CORRECTION WEIGHTED M.G.H.

CORRECT M.G.H.

627

51/10-1

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1020 MO

TIME

500 8011 2

102)

FOPM31 / DEC 87

BWI DREWATER

MEASI IDENIENT NO	
COMPILED BY CHECKED BY	Distance from
STATION NAME SOUTH FIRST CREEK (SWOGOOS)	
19 82 PARTY JA	1,230
METHOD GOW AM FUNES WA G.H. CHANGE IN 15 HRS	
4/4	1235
MEAS, PLOTS NAT & DIFF. FROM RATING HET ABOVE FOLLOWS. UPSTR, DOWNSTR, SIDE BRIDGE NAT FEET MILE ABOVE FOLLOWS.	1245
. E	1262
FLOW LOW-MOD WEATHER WARM SUNNY . IT WIND	
ОТНЕЯ 90° ст. 120°	
00000	
3	
INTERPRETATION OF THE PLUSHED IN	
OBSERVER	

1			OUTSIDE	0 40	01.7	24.0							
			INSIDE										
	GAGE READINGS	0100000	DECORDER	0,410	0110	240							
	GAGE RI												
		TIME	3001	1403	1245					WEIGHTED M.G.H.	G.H. CORRECTION	CORRECT M.G.H.	

FOPM31 / DEC 87

Discharge	LONG																				
Area	nw 1	6915	6915	-										-							
Velocity	200 A	Q = .	. 0	0= 1				100	2												
Time in Seconds	RING							7/6	3												
Revolutions	TED	40	04	04				1	3									1			
Depth	RT M	2	0	= 0.				0	1												
Width	574	n	1	7																	
Distance from Initial Point	1230	1235	1945	1202																	
	1 1	RS.	ON	§ 1	9	1		· .	1	 	1 - 1	<u> </u>	_		 	_	_	_	_	<u> </u>	_ _

were

CONTROL / - NOTEH

REMARKS

G.H. OF ZERO FLOW_

MEASUREMENT NO. COMPILED BY CHECKED BY STATION NAME CR	DATE 8420 / 7/30 7/30 19 84 РАВТУ 76 0% 0% WIDTH WA AREA ALA VEL. MA G.H. 0113 DISCH 0.01/3 DISCH 0.01/3 METHOD 100 MM FLUME WA G.H. CHANGE Q IN . S. HRS.	METER TYPE SPIN BEFORE MEAS. MAA MEAS PLOTS WEAS PLOTS WATCH AND MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	FLOW LOW - UNIFOLM WEATHER WARM SUNINY OTHER	STAFF - 6000 CONO WATER 05 RECORD REMOVED EARLIEL INTAKE	OBSERVER
MEASI COMPI CHECK	DATE WIDTH METHC	METER SPIN B METER WADIN	FLOW A	GAGE	OBSER

				_				
REAM		6			OUTSIDE	0.13	0.12	
520,00					INSIDE			
The d			ADINGS		RECORDER		0.13	
1 20			GAGE READINGS					
CONTROL CEMENT Y - NOTEH SO UPSIFEAM		FLOW						
CONTROL	REMARKS	G.H. OF ZERO FLOW			TIME	98.81	1343	

WEIGHTED M.G.H. G.H. CORRECTION

CORRECT M.G.H.

Discharge		AT C	0113	0413								
Arba	E IN		1 0 0	2-0								
Velocity	FLUM	9	7 3	- 3								
Time in Seconds	Who s	12	5.	10		6113						
Revolutions	4 100	0.00	60'0	9.0	- 4	10	>					
Depth	T UP	71		1 = U	(C IN	\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\					
Width	SE											
Distance from Initial Point	1335	1336	1343	1346					-			

METER TYPE SPIN BEFORE MEAS. AFTER MEAS. PLOTS WADING, UPSTRC_DOWNSIR, SIDE BRIDGE COME, FEET, MILE, ABOVE, BELOW, GAGE, AND MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION
METER TYPE SPIN BEFORE MEAS. SPIN BEFORE MEAS. MEAS. PLOTS MEAS. PLOTS WADING, UPSTRCDOWNSIR, SIDE BRIDGE TO MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION FLOW COLD TO FOLLOWING CONDITIONS: CROSS SECTION FLOW COLD TO FOLLOWING CONDITIONS: CROSS SECTION
METER TYPE SPIN BEFORE MEAS. SPIN BEFORE MEAS. MEAS. PLOTS WADING, UPSTRCDOWNSIR, SIDE BRIDGE 3C MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION FLOW CEC (1/1) For WEATHER CASE FOR THER CASE FOR THERE CASE FOR THE C
HETER TYPE PIN BEFORE MEAS. REAS. PLOTS MEAS. WDIFF. FROM MEAS. RATER RATING MADING, UPSTRCDOWNSIR: SIDE BRIDGE GC MATER RATING RATING
METER TYPE SPIN BEFORE MEAS. SPIN BEFORE MEAS. SPIN BEFORE MEAS. MEAS. PLOTS WADING, UPSTRCDOWNSIR, SIDE BRIDGE 3C MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION FLOW CALL (1/1), FC AIR RC AIR RC AND AND AND AND AND AND AND AN

G.H. OF ZERO FLOW	A THE THE PERSON OF THE PERSON	The second section of the second second section 1 and 100 section		FT	
	GAGE READINGS	DINGS			
TIME		RECORDER	INSIDE	OUTSIDE	
1425				2270	
WEIGHTED M.G.H.					
G.H. CORRECTION					
CORRECT M.G.H.					

Discharge																		
Area		7.30	0/1/01	5/1/1/	1450	1 0	181	20,										
Vetocity						e Keii	0	16:1			<u>``</u>							
Time in Seconds		C.F.s	10801	1001	1001	2000	P. S. 1	> 3/2 FL	130	\s\ / \	604 C.	75 0	5,7	C				
Revolutions	ئ د					of ve	XC : 0	K HO		20	2.10	1347	25.8.	00/	11	0		
Depth	1 4/6	1 C.	2/,	8/,	8/,	5.75	Se X	2740		1	2.18		2 3		.6	S		
Width	0 53 0						F 76	10/20	5.	75,	7	X						
Distance from Initial Point	S.		14	12	# 3	70.7	16,5	7c to.				C.R.10			-			

1,20°)

V-noteh

CONTROL Cleanes +

REMARKS FE

RATING 30 FEET, MILE, ABOVE, (BELOW GAGE, AND G.H. O . 20 DISCH. OG MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION HRS. 40/2/0 0 1231 Cecory U INTAKE FLUSHED L Z | |% |% 1st Coeck б 19 5 9 PARTY 767 G.H. CHANGE WATER 18. AIR SE WEATHER _____ CRECORD REMOVED SPIN BEFORE MEAS. AFTER MEAS. PLOTS "DIFF. FROM WADING, UPSTR. COWNSTR., SIDE BRIDGE. STATION NAME S'CUOFOO? 76 3/29 F /413 & NO. SECS AREA uniform 10001 89272 MEASUREMENT NO. COMPILED BY CHECKED BY METER TYPE SPIN BEFORE MEAS. 9 1 FLOW / C: CE/ OBSERVER METHOD GAGE OTHER WIDTH

CONTROL Cement Unoteh aven REMARKS General Concernent of Tell Sempling Suspended Souls sangle tallen G.H. OF ZERO FLOW

	GAGE READINGS	ADINGS			-
TIME		RECORDER	INSIDE	OUTSIDE	1
WEIGHTED M.G.H.					
G.H. CORRECTION					
CORRECT M.G.H.					

Discharge						1242																						
Area		/ine		75.37	16	250		7421				8/2: -		1./6													-	
Velocity			.70				20		17	5,		1/12		745c	1			\mathcal{L}										
Time in Seconds		(FS	0565	10865		5 280	0643	5850	(470	2		70 02	2	0		, ,	(47,	643 61		1427	296	5/9	0	590	00			
Revolutions	() ()	*					76		(it the		16 1		XX	J	7,30	2112	1.00		1 , 34	2 , 63		7. 7.					
Depth	1-/6	6 CA	·	1/3		511	111.	ET.	11.	c +4 0		2016		oxh a		,/6	136	,6/'		1								
Width	20									1/60	(10		de		.51	18/5.	10=		*								
Distance from Initial Point	100			#		# 2		* 3		Yaka.		700	>	10 th						00			•					

MEASUREMENT NO. SOMPILED BY CHECKED BY	78				
STATION NAME 56	108004	5.	Stice	2 1	
NDTH REPORT	222 9/22 ,19 8/2 AREA /47_C NO. SECS	VEL. G.H. CHANGE	G.H. Nen e	DISCH., 6.4/	
MEAS. PLOTS % DIFF. FROM WEAS. % DIFF. FROM WADING UPSTB, DOWNSTR., SIDE BRIDGE	AFTER ** DIFF. FROM ISTR., SIDE BRIDGE	RATING	AILE (A <u>BOVĒ</u> , B	FATING (FEET) MILE (ABOVE) BELOW GAGE, AND	_
MÉÁSUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	EXCELLENT (2%), GOOI IS: CROSS SECTION	O (5%), FAIR (8%)	, POOR (OVER	8%), BASED ON	
FLOW CHAS UN	iferm WEA	WEATHER C CO	Cer - 410	(; < ;	
ОТНЕВ		AIR	\$ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	1322	
SAGE		WATER	9 ⁷ °		
	_ RECORD REMOVED		INTAKE FLUSHED L	U SHED L	
OBSERVER					
CONTROL					
REMARKS (Sec.1)	San Min	54560 PC	cated to	If the	10
3.H. OF ZERO FLOW	7			FT	
	GAGE RE	READINGS			
TIME		RECORDER	INSIDE	OUTSIDE	

1 Discharge		ئ	0	6.5	· \	5	35/7	1/2/							_
Area		7/2	0/1/	7/5/	0/1/	18,30		ر ا ا							
Velocity							(1	22.5		7	CRS				
Time in Seconds	2	CFS	.0360	.0360	.0360	7	25 7:0	201	135,	10/	2360				
Revalutions	- Jun					27 /6	S S S	H JO	1,	11	7. =				
Depth	7	10 CP	010	0/,	0/1	37.75	Se 75	273	2//-/	(10				
Width	3		-				if the	20	5	8/5.	1 = 1				
Distance from Initial Point	10		#/	# 2	Z X	10x2	70,00	10 kg							

FOPM31 / DEC 87

WEIGHTED M.G.H.

CORRECT M.G.H.

MEASUREMENT NO. COMPILED BY CHECKED BY	Distance from Initial Point Wri
NAME PEORTA INTERCENDR (SWILDOL) 89116 4/26 1989 PARTY (TL, LB, KH LONE THROTED	175
# ¥ €	707 - 7
G000 (5	
FLOW 10W - UNIEOKM WEATHER (00L, С10U0У ОТНЕЯ 50° 4® 1010	
GAGE STAFF WATER 50° OF® 1010 NTAKE FILISHED I	
OBSERVER	
CONTROL	
REMARKS	
G.H. OF ZERO FLOW	
GAGE READINGS	
TIME RECORDER INSIDE CUTSIDE	
11.25 572 . 73	

Discharge										145	ערא			
Area										PLATE	RECENTLY			
Velocity	FLUME									METAL	INSTALLED			
Time in Seconds	THROATED	2 ,),		4					V-NOTCH	BEEN IN			
Revolutions	1 1	0.900	0.750	15	75.4					MEN	00			
Depth	SNOT	11	9	9	7	5								
Width	USED	- 70	- 70 h	4	=0	T	=							
Distance from Initial Point		70T.	707-											

FOPM31 / DEC 87

WEIGHTED M.G.H. G.H. CORRECTION

CORRECT M.G.H.

MEASUREMENT NO. COMPILED BY CHECKED BY	2 2
STATION NAME PEOPLY	1
DATE 89201 120 1989 PARTY 16- 01. 0.1570 WIDTH NA AREA NA VEL. NA GH. 0.107 DISCH. 0.1570	
METHOD 200MM FLUMES NA G.H. CHANGE O IN JA HRS.	1
METER TYPE // A SPIN BEFORE MEAS. // A SPIN BEFORE MEAS. PLOTS WILE, ABOVE, RELOW GAGE, AND WADING, UPSTRE, DOWNSTRY, SIDE BRIDGE 3/2 FEET, MILE, ABOVE, RELOW GAGE, AND	
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	4 1
FLOW LOW -UNIFORM WEATHER WARM & SUMNY	7
ОТНЕЯ АІВ "90 — 4® /7/5	1 \
GAGE METAL V-NORTH WETR WATER 65 OF 1715	1
RECORD REMOVED #RRU/ER INTAKE FLUSHED L NO	1
OBSERVER	
CONTROL 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	1 1

GAGE READINGS	DINGS			
	RECORDER	INSIDE	OUTSIDE	-
			0.69	
	0,09		0.8	
	0.69		0.69	

G.H. OF ZERO FLOW_

REMARKS

Area Discharge	ANNEL	1570	210	1	0	- 1	1 1				 - 1	- 1			,	
Area	3	+		7	2											
	H4.	0	0.1	0,10	0.1			570								
Velocity	IN	02	(N =	92	0			711								
Time in Seconds	FUME			,	·			(5							
Revolutions	200 MM	0,1	0117	0,17	0.17				141							
Depth	200	MC	11	h=	11				1							
Width	567															
Distance from Initial Point	11/0	9121	1719	[733	1727											

CH THURSDAY					
CHECKED BY	626				Distance fro
STATION NAME SEL	110011	Peolia Interceptor	creento		10.0
WIDTH /cc/mm	AREA AREA	19 8.7 PARTY GOOD OF THE G.H. CHANGE	02 7 6 G.H 70.	PARTY GROWN TO SECONOCH, COYFE G.H. CHANGE TO CE IN 1/2 HRS.	1 1
METER TYPE SPIN BEFORE MEAS. MEAS. PLOTS WADING, UPSTR. COOM	METER TYPE SPIN BEFORE MEAS. MEAS. PLOTS MEAS. PLOTS WADING, UPSTR. QOWNSTR., SIDE BRIDGE	RATING	MILE, ABÓVE, B	ELOW GAGE, AND	# 1 1 N
MEASUREMENT RATED FOLLOWING CONDITION	MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	D (5%), FAIR (8%), POOR (OVER	8%), BASED ON	×
FLOW LOSA?	WEA	WEATHER BOLL		Record flash 15550	100
ОТНЕЯ		AIR	AIR SS 40	0630	
GAGE 0.72	RECORD REMOVED	WA		of@ C92	3
OBSERVER			- INTEREST		
CONTROL Meta	1 V-hotet	Wei			
HEMARKS Tec	Sergering				
G.H. OF ZERO FLOW				<u>L</u>	
	GAGE READINGS	ADINGS			1)ax
TIME		RECORDER	INSIDE	OUTSIDE	

Discharge								(0)										
Area	ď	71,2 e	0845	55 30	0360	5,	8%.	17 tu										
Velocity	Fler					27.2		1/1/	19		اما						00	
Time in Seconds	400/	SYS	h21.0'	04.92	5640	* 00°	0 50	40 ×	4	3 ,12	40 28	2		CA			80 3	
Revolutions	thos					0 × 0 × 0 ×	0 0	9 70	,/5/.	20	650.	1 Cleur	Pino	1750	02019	0600	2.70	
Depth	500	400	77.	7/5	1/2	709	j X	Lest	1, 45	-8/3:	1/2 =	Sher	7/7	CH111	Time	Uspel	Galls C	
Width	n a					16.15	at trul	42/0			5 3	2000				250	550	
Distance from Initial Point	10.0		/#	# S	*	Total	70.00	10				Jake						

FOPM31 / DEC 87

WEIGHTED M.G.H. G.H. CORRECTION

CORRECT M.G.H.

TEN AND REN 83101

DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

MEASUREMENT NO. COMPILED BY CHECKED BY

INTERCEPTOR STATION NAME HAVANA

DISCH. 1.458 G.H. CHANGE -0,01 IN 0.5 HRS. 246 VEL 0.592 G.H. NA AREA METHOD FLOW METER NO. SECS AP211 8.4 DATE 9101 WIDTH

PYCMY CURRENT NOWNERYS #625 GURLEY METER TYPE GUKLA SPIN BEFORE MEAS. 44

METER 1775
SPIN BEFORE MEAS. 44 AFTER AVA
MEAS. PLOTS % DIFF. FROM
WADING, UPSTR. DOWNSTR. SIDE BRIDGE ACE, MILE, ABOVE, BELOW GAGE, AND MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

LT KSmoh oF@_ ₽ @ MODERATE WEATHER PARTLY SUNNY AIR 35 WATER 45 INSTALLED 6 GAGE NONE FLOW LOW OTHER

INTAKE FLUSHED L NO RECORD REMOVED NONE

OBSERVER

151. BLOCKAGE DOWNSTREAM CAUSING BACKUP BRIDGE WHICH SPANS DOWNSTREGM FROM BUBBLER UNDER REMARKS DIRECTLY CONTROL NONE

G.H. OF ZERO FLOW

	OUTSIDE	,52	,52	15,					
	INSIDE	*							
GAGE READINGS	RECORDER				4.				
GAGE RI									
	TIME	1515	1530	1545			WEIGHTED M.G.H.	G.H. CORRECTION	CORRECT M.G.H.

i g	
Distance from	

												1											_					1 .
Discharge	0.000	0,000	0.016	0.034	0000	0	1	180.0	611.0	0.137	0,129	0.133	141.0	0.133	0.120	101.0	0.077	0.050	0.038	0.000	0.000	0.000						
Area	1/61	3	740'	.072	401	である。	100	172	192	,208	128	,200	,200	921'	156	132	001.	080	,052	470'	400.	0						
Velocity	Total Control	0	1367	.333	COH.	004.	.433	005'	.600	1.09	. 56.7	1.00.	.733	.700	167	1.201.	727.	.700	533	0	0	0						
Time in Seconds	30	30	30	8	8	R	30	30	30	30	30	30	30	30	3	30	30	30	30	30	30	30						
Revolutions	0	0	11	01	12	7/	61	15	18	20	1.1	20	22	21	73	43	23	21	16	0	0	0						
Depth	0	0.00	0.11	0.18	0.26	0.33	0,40	0,43	0,46	0,52	0.57	0,50	0.50	44.0	0.39	0.33	250	0,20	0.13	0.00	10.0	0						
Width	.2	† ,	4.	μ,	7,	۲,	۴.	۲.	Ŧ,	7	7	4,	7	+ ,	۲,	7.	7,	7	7,	7.	Н,	77						
Distance from Initial Point	2.7	3	3.5	3.9	4.3	4.7	5.1	5,5	5.4	6.3	6.1	7.1	1.5	7.9	8.3	8.7	9.1	9,5	9.9	6.01	10.7	11.1						

R. L. STOLLAR & ASSOCIATES

7.0.7 RE REM

1325

BEGIN END

DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. COMPILED BY CHECKED BY

INTERCEPTOR KHE DOSERU HAVANA STATION NAME

50011 WS

DISCH. 366 HRS. Z AREA 100 89 BARTY KH JK LB
AREA 1000 VEL. 5,80 G.H. NA
NO. SECS 50 H AP NPr 89116 METHOD DATE WIDTH

METER TYPE (1/6/M) SPIN BEFORE MEAS. 49 AFTER NA RATINGS PLOTS 89116 MEAS. PLOTS 8010 BELOW GAGE AND MEAS. PLOTS 8010 BELOW GAGE AND METER NO MEAS. PLOTS 8010 BELOW GAGE AND METER NO METER NO

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

HOWS-O OMIM 17-1324 1324 INTAKE FLUSHED L oF@ ₽ @ 75 33 WEATHER SUNNY AIR WATER RECORD REMOVED LOW UNIFORM OBSERVER NON E OTHER _ FLOW GAGE

RECORDER OF STAFF 0 LOW FLOW NONF CONTROL REMARKS G.H. OF ZERO FLOW

	GAGE READINGS	ADINGS			1
TIME		RECORDER	HASIDE	OUTSIDE	1
1330	MEASURED WITH	NA		0.25	<u>'</u>
					<u>'</u>
					<u>. </u>
WEIGHTED M.G.H.					
G.H. CORRECTION					
CORRECT M.G.H.					

1	_1				ĺΝ̈́	15	7	225	M	375	575	275	m	1		1	ļ	1	1	1)	\ -	9	Į	l		1						
	Discharge	С	O	0	202025	54960.	.040.	20050.	2840'	046875	ST20HO.	270240.	6420,	ગ	٥	0	0	0				\	0 2 b	7									
	Area	0	.012	050,	Z40'	450'	990.	690.	₹L0.	.075	690"	590.	450.	000	000	.000	000	000.	3			/	do.	0.0									
	Velocity	0	0	0	520.	519.	.70	,725	.60	579.	.675	.725	.45	0	0	0	0	0		1	\	280017	200										
·	Seconds	4	40	40	40	40	10	40	40	40	40	40	40	40	0 <i>†</i> 1	40	40	011				,											
	Revolutions	0	0	٥	25	27	28	5-6	74	25	27	29	ā	0	0	0	0	0															
	Depth	0	0.04	0.10	5.0	91.0	0.22	67.0	0,24	0.25	0.23	0.21	81.0	0.13	0.11	20.0	20.0	0 75	ł														
	Width	0.15	6.9	6,0	6,0	6.9	6.9	0.3	5,0	0,0	6.9	0.3	6,0	0,3	6.3	0,3	0.3	\mathcal{J}															
	Distance from Initial Point	2,2	2.5	2.8	3.1	3,4	3.7	4.0	4.3	e +	4.9	5.2	5.5	8	- e	2.	6.7	7.0															

MEASUREMENT NO. COMPILED BY CHECKED BY	Distance fro
STATION NAME HAYANA INTERCEPTOR 11002	
DATE 8920/ 730/с 19 89 РАЯТУ 76 31/2 DISCH Д 3670	
METHOD AND MM FLUNDS SECS NA G.H. CHANGE Q IN 5 HRS.	16.30
MEAS. PY AFTER NA	1635
MEAN FLOIS MACHON CONNETRY SIDE BRIDGE 350 FEET MILE, ABOVE AELOW GAGE, AND BURBLE LANGE	1639
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	
FLOW LOW - SEMI-UNIFORM WEATHER WARM - SUMMY	1041
ОТНЕЯ 40 40 40 ФФ 1640	1-104
GAGE NOWE INSTALLED WATER TO OF 1640	1/2 6
RECORD REMOVED NP INTAKE FLUSHED L NO	9
OBSERVER	669

G.H. OF ZERO FLOW				F	
	GAGE READINGS	ADINGS			
TIME		RECORDER	HASIDE	OUTSIDE	10
1691	DEPTH OUEKE			L	10000
1021	CRID	0.2305			
					-
WEIGHTED M.G.H.					
G.H. CORRECTION					
CORRECT M.G.H.					

FOPM31 / DEC 87

Discharge			EAM		0		5										
Area			als a	NA	1.324	301	1.30	20	3673								
Velocity			EI	7	2 = 6	0 %	0 ~ 6	2=0	0:0								
Time in Seconds			1 FLUM)))			70/	2				
Revolutions			BOOM	,00'	121	35	1.28	36.	388		41,	2	3				
Depth			1	0 = 0	2 2	0 "	110	1/2 0	1 × 0	į	F. N/41	1	3				
Width			36	1	7												
Distance from Initial Point			1630	1635	1639.	(43	1-10-17	1601	669					1000			
 	•	i,	2		Q								B	\$	 	 $\overline{}$	 _

HOREX 75 FEET

W MEASURED & LEND OF CONCRETE

CONTROL MONE HUSTALLED

REMARKS Q

MEASUREMENT NO. COMPILED BY CHECKED BY	Dist
STATION NAME SEULLOOZ HELLENSEL L'AFERE C, 2/60	
89276 9/27 1982 PARTY G/28 76 556 5 55 6 2 5 5 6 5 5 5 5 5 5 5 5 5 5	
METHOD F/4, C NO. SECS G.H. CHANGE IN HRS.	
METER TYPE SPIN BEFORE MEAS. AFTER MEAS PLOTS % DIFF. FROM RATING WADING, UPSTR (DOWNSTR.) SIDE BRIDGE SCOLET, MILE, ABOVE, <u>BELOW, GAGE</u> ? AND	
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	
FLOWS. IN Charles weather Beachy already	ł
OTHER AIR 25 F@ (C3C)	1 , 1
GAGE DEGAS QUECLEUSSIEN 110 @ WATER OF®	
RECORD REMOVED 1/0 INTAKE FLUSHED L2/0	Ĭ
OBSERVER	101

MARKS Fall	REMARKS Fall Sampling, Mersenement made	35 mer	Servemen	of mondo	
. Secon	the codat	Moscale	ahana	6 /	
G.H. OF ZERO FLOW				FT	1
	GAGE READINGS	ADINGS			
TIME		RECORDER	INSIDE	OUTSIDE	
					1
					-
					-
					-
					<u> </u>
					-
WEIGHTED M.G.H.					
G.H. CORRECTION					-
CORRECT M.G.H.					

FOPM31 / DEC 87

Discharge			
Area	. V &	S 0 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	100 100 100 100 100 100 100 100 100 100
Velocity	7600		
Time in Seconds	1.500 1.4500	.490°C	in in its series
Revolutions	7		25.23 2.650 2.000
Depth		~ ~	10 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Width	2) V		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Distance from Initial Point	1 // 1 // 1	N X	10 Je 27 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

CONTROL CLASSIC XC

DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

STACT: 1028 570P 1048

LOCKING downstaw

RATING FEET, MILE, ABOVE, BELOW GAGE, AND 89110 19 89 PARTY JK SG 1.92 VEL. 2.40 GH. NA G.H. CHANGE NA 520% PO METER TYPE PYGMY
SPIN BEFORE MEAS. 47 AFTER 45
MEAS. PLOTS % DIFF. FROM
WADING, UPSTR., DOWNSTR., SIDE BRIDGE 40 STATION NAME LEYALDA DITZH C AREA NO. SECS. APRIL 20 00) MEASUREMENT NO. COMPILED BY CHECKED BY METHOD WIDTH

DISCH. 0,324

IN B HRS.

WEATHER SUMING ~ 65°F, NO WIND, SL. CLOUDY MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION FLOW LOW, UNIFORM

INTAKE FLUSHED L NONE 1030 40 1030 oF@ 29. AIA WATER 55 NONG RECORD REMOVED OBSERVER OTHER GAGE

REMARKS BOTTON VERY SOFT, SINTY, BANK OF VARIBLE WITH - DIXTH 26C. INSTALLED TAKKNI AS LINGIN PARTOIS CHANNIEL NONE G.H. OF ZERO FLOW CONTROL

占

OUTSIDE INSIDE RECORDER GAGE READINGS 1030 St G.H. CORRECTION WEIGHTED M.G.H. CORRECT M.G.H. TIME

Discharge	0000	00000	0.000	1.002	0.025	0.038	0,033	0.038	6,049	0.030	130.0	1400	6.032	0.000	0,000	0000	0.000	00000	
Area	00000	0.045	4800	660'4	6600	0.183	0.130	0.126	0.150	6.150	0.153	0510	147	89110	0.144	601.0	0.037	0.015	
Vetocity	00000	0.000	0.000	0.025	0,350	0,235	51E.0	0320	0.325	0,300	0,375	0,275	0:150	0,000	0.00	0.000	0000	0.000	
Time in Seconds	٥	ah	дh	57	26	40	45	40	70	40	40	40	3	40	NO	40	240	40	
Revolutions	0	0	0	,	70	Ċ	11	7	(3	8	15	//	. •	٥,	0	0	0	0	
Depth	8	.15	.28	133	. 53	,/5	40,	142	150	.50	.51	150	149	56	87	,35	5/	5/	
Width	\$15.45	,30	30	30	38	30	.30	,30	30	130	,30	130	R	136	05'	30	3075	01.	
Distance from Initial Point	2,1'	3,4	371	30,	33,	36	3.9'	4,2,	45'	481	2,1,	5.41	5.71	6.0	6.31	6.6	16.9	7.1	

FOPM31 / DEC 87

0.329

6

07,00

_RATING _____ FEET, MILE, ABOVE, BELOW G Z MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BA FOLLOWING CONDITIONS: CROSS SECTION INTAKE FLUSHED L OF@ /S. 4@ / S WEATHER CITCEL WATER C C AIR . OC G.H. CHANGE RECORD REMOVED 775 STATION NAME SENTECON METHOD ATTENTION SECS CONTROL CONTROL 87268 1010 30/ MEASUREMENT NO. COMPILED BY CHECKED BY G.H. OF ZERO FLOW REMARKS C OBSERVER DATE WIDTH OTHER FLOW GAGE

	Distance from Initial Point	Width	Depth	Revolutions	Time in Seconds	Velocity	Area	Discharge
	1001	£ 5	Elen	26-				
DISCH.,2 7			1 P		SYS		1 in c	
IN HRS.	H		,30		5725		55%/	
OW GAGE, AND	#2		15.		8/255		15051	
%), BASED ON	C M		18.		,2748		2/3/	
150-5	Tota	30.3	th 0.7	rehen	ence	703	150	
15/6	Tone	7 4	1, 0,	7	Q O	1	•	3
ED	h 1		1	8				3
	To tal	wen	12 CF	120	13 tu	, = 03	351	
		1		N				
		148-	175	177	2			
			,	1				
		0 = 05		2/2	8 075			
FT								
OUTSIDE								

INSIDE

RECORDER

TIME

WEIGHTED M.G.H. G.H. CORRECTION

CORRECT M.G.H.

GAGE READINGS

START = 1520 REW END = 1547 LEW

3.30

DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

12005 UNALDA WY89 #1 SOUTH 4.00' 89080 MEASUREMENT NO. COMPILED BY CHECKED BY STATION NAME DATE WIDTH

3/21 19 89 PARTY JK LB
AREA 1938 VEL. 380 G.H. 3,85 DISCH. 2/60
NO. SECS 39/40 /4. CHANGE O IN 5 HRS. IN S HRS. METHOD

METER TYPE PY6N Y NO. 635
SPIN BEFORE MEAS. 55 AFTER 15
MEAS. PLOTS 2DIFF. FROM RATING
WADING, UPSTR. COWNSTR), SIDE BRIDGE 50 FEE

FEET, MILE, ABOVE (BELOW GAGE) AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION GOOD - WARM SUNNY LOW - MOD/UNTFORM WEATHER FLOW

009/ @± AIR .43 45 WATER CONO GAGE STAFF - 6000 OTHER

INTAKE FLUSHED (C) NES 5 RECORD REMOVED

OBSERVER

WEIR - 30' UPSTREAM OF NEAS TH. HAS METAL SHEETING BANL REMARKS Q LOCATEON CEMENT EAST CONTROL

G.H. OF ZERO FLOW

3.85 OUTSIDE 3.85 3.85 3.85 BOISNI RECORDER 3.85, 3.85 3.85 GAGE READINGS G.H. CORRECTION WEIGHTED M.G.H. CORRECT M.G.H. 8891 1520 1547 TIME

Discharge	0.00	0.000	0.013	0.050	0.035	4000	6.034	0.038	0.026	0.016	0000	0000	0000	00000	1	0.70										
Area	0.030	0.000	9,000	6600	0.075	0.078	0.084	0.087	0.066	0.01.8	0.063	0.063	0.057	0.048	1	1978	00110									
Velocity	0,000	0.000	0.20	0 533	0.467	0.567	0.400	0,433	0,400	0.233	1000	0,000	0.000	0.00	1000	1000										
Time in Seconds	Ø	8	40	30	30	30	30	30	30	R	30	30	n	Ø	'											
Revolutions	Ø	Ø	8	91	14	17	12	(3	12	7	8	0	0	0												
Depth	.13	,26.	. BZ	181	.25	96.	88,	139	122'	133	اه:	181	61.	61.												
Width	<i>51</i> ·	8	.30	,30	. 30	.30	,30	.30	.30	,30	,3 0	É	.30	. 25												
Distance from Initial Point	2.35'	2,65	3.95	3,25	3,55	3,85	4.15	4,45	4.75	5.05	5.35	5.65	5.92	6.30							-					

FINISH TOTA

R. L. STOLLAR & ASSOCIATES DISCHARGE MEASUREMENT NOTES

MEASUREMENT NO. 1/4/8/4/2/ COMPILED BY CHECKED BY	0.	Sista Star
50v	50021	a
DATE \$9080 3/21 19 89 МРАВТУ LB мОТН 4.0 AREA 0.910 VEL. 0.310 G.H. 8	B Jr H. 3,85 DISCH.0,299	an
METHOD METER NO. SECS 1475 STATIONS CHANG	Ø	60
METER TYPE P/6 M/ # 625 SPIN BEFORE MEAS. GS AFTER 45 MEAS. PLOTS BIFF. FROM RATING MADING LIPSTR (DOWNSTE) SIDE BRIDGE CO. P.	RATING POWE ACTIONS OF THE ADONE ACTION OF THE	001
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	DOR (OVER 8%), BASED ON	41
FLOW LOW-MOD WEATHER WARM	WEATHER WARM, SUNNY, LT BREELE	M
OTHER AIR .45	1600 Es /600	11 43
STAFF - GOOD - CONP WAT		10
RECORD REMOVED NO	INTAKE FLUSHED	è
OBSERVER		
CONTROL LEMENT WELR - 30' UPSTREAM	REAM	
REMARKS OF LOCATION HAS METAL SHEFTING	SHEFTING ON	
l	1101	

G.H. OF ZERO FLOW			FT	
GAGE	GAGE READINGS			
TIME	RECORDER	INSIDE	OUTSIDE	
1554	3.85/		3.85	
1606	3.85/		3.851	
143	3.85		3.85	
WEIGHTED M.G.H.				
G.H. CORRECTION				
совяест м.а.н.	3.85		3.83	

BANK

EAST

	Discharge	0.600	0,000	0.017	0,646	0.046	0,046	6.033	0.053	6.029	0.017	0.000	0.00	0.000	0.000	1000	2000										
	Агва	1.624	1_ `	0.075	0,087	0,087	1800	0,087	0.084	0,072	0.075	0.069	0.063.	169.0	8000	1	10:	296.0									
69	Velocity	0.000	0,133	0.233	0.533	0.533	0.567	0.367	0,633	004.0	0.233	0.033	0000	0.000	0000		0.30										
	Time in Seconds	Ø	30	30	30	30	Œ	30	30	\mathcal{B}	30	B	B	R	30												
	Revolutions	0	4	7	91	91	17	//	61	13	2	/	Ø	Ø	Ø												
	Depth	1/2	.23	50'	B.	3C.	.27	.29	.38	34	185	.23	77.	91'	61.												
6).	Width	. 20	8	. 30	.30	8	.30	.30	,30	8	Ė	.30	33	.30	.20												
2.20	Distance from Initial Point	2.40	2,70	3.00	3,30	3.60	3.90	1,30	24.50	4.80	2,10	5.49	5.70	8.9	6,30												

STAKE 1259 3.81 EW. 1.8 FINISH 13:31

R. L. STOLLAR & ASSOCIATES DISCHARGE MEASUREMENT NOTES

JOHN JOHN JOHN JOHN JOHN JOHN JOHN JOHN	
STATION NAME SOUTH UVALDA SWIZOOS	
DATE 89107 4/17 19 89 PARTY SG KH JK WIDTH 411 AREA 80815 VEL 542 G.H. 3/81 DISCH 0.353	сн. д. 353
METHOD $FLow(0.6)$ No. SECS 647 G.H. CHANGE IN IN	HRS.
METER TYPE PYGMY CURRENT METER (GURLEY) #625 NO. NN 6349	UN6349
SPIN BEFORE MEAS. 60 SEC. ATTEN 25. SEC. MEAS. PLOTS % DIFF, FROM RATING WADING, UPSTR., DOWNSTR., SIDE BRIDGE FEET, MILE, ABOVE, BELOW GAGE, AND	V GAGE, AND
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	BASED ON
FLOW KOW -MODERATE WEATHER SUNNY, WIND 4 5mph	Howe
ОТНЕЯ AIR 60 4® 1248	942
GAGE WATER 55 °F® 1248	248
RECORD REMOVED LINTAKE FLUSHED L	اد د
OBSERVER PAUL WATTE, BRAD STEPHENSON	

G.H. OF ZERO FLOW				FT	-
	GAGE READINGS	SDNIC			1
TIME		RECORDER	INSIDE	OUTSIDE	
1203	READING TO GH	KENDING 3. 82		3.82	<u> </u>
1254		3.81		3.81	
1321	*	3,81		3.81	
1331		3,81		3.81	<u> </u>
					<u> </u>
					<u> </u>
WEIGHTED M.G.H.					1
G.H. CORRECTION					
CORRECT MGH					

REMARKS CONTROL

1 -	10	1	_					75) _		10	_	_	S				352		1		1	i				
Discharge	0,0		1110.	10189	,025	1920,	810.	,02.337.5	4050.	03105	\$870-	30150.	,0297	.0324	31420'	.0228	000'	١	0.36	2								
Area	, 000		.036	.036	040.	,04U	.036	.0425	150.	,c54	870'	,054	h50'	H50'	240°	150	000.		6	250								
Velocity	000		475	. 525	1 625	. 675	.50	. 55	. 40	0575	09,	.515	,55	09.	.575	04'	000.		\	0.543								
Time in Seconds	OH		40	40	94	04	01	40	40	40	40	40	40	40	04	040	40											
Revolutions	0.0	261-417	19	الم	25	27	20	77	16	23	24	23	22	74	23	5	0											
Depth	さずる	\$	81.	81,	0,50	0,22	0,18	0.17	0,17	81.0	0.16	8110	0, 68	0.18	6.14	61.0	0.00											
Wighten	る大な大かり	14 0.3°	0,2	2.0	0.7	2,0	2,0	0.25	6.3	0,3	0.3	6,0	0,3	0,3	6.0	6,0	0.15											
Distance from		2		2,4	2,6	2.8	3.0.	3,2	3,5	3.6	4.1	7,4	4.7	5.0	5,3	5.6	5.0											

MEASUREMENT NO. COMPILED BY CHECKED BY
STATION NAME S. CLUZIDA (SW12005)
DATE 111 4 /21 19 89 PARTY JR, 85
- 1
METHOD TOURS NO. SECS G.H. CHANGE O IN HRS.
METER TYPE ~ 4
SPIN BEFORE MEAS. A/A AFTER MEAS. PLOTS % DIFF. FROM RATING.
WADING, UPSTR DOWNSTB., SIDE BRIDGE 30 REET MILE, ABOVE, BELOW GAGE) AND
MEASUREMENT RATED (XCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS-SECTION
FLOW SEM! - UNIFORM WEATHER D. CLOSEDS
ОТНЕЯ 75 4® 1530
GAGE OK WATER 55 OF 1520
INITAG
OBSERVER RT

CONTROL 016				
REMARKS 15T	15T TIME W/0.66 LONG THROATED	10.06	1006 +	HOATED
FLUME				
G.H. OF ZERO FLOW	3.43			FT
	GAGE READINGS	ADINGS		
TIME		RECORDER	INSIDE	OUTSIDE
5251		3.84		2.84
		,		

		OUTSIDE	3.84	3.84	3.84				3.84
		INSIDE							
COMON	ADINGS	RECORDER	3.84	3.84	3.84				3.84
20 20 40	GAGE READINGS								
		TIME	525	20	55) M.G.H.	JECTION .	M.G.H.
		1	5	1550	1535		WEIGHTED M.G.H.	G.H. CORRECTION	CORRECT M.G.H.

	Discharge										\ \ \				0	9						
	Area										2	1				2						
	Velocity										79 -)			615,	T						
<u>.</u>	Seconds						HER				1101				2.0							
	Revolutions		r tube	2166	of Tube	0	OF WATER		72	72		7.00	08/11		7 =	2						
	Depth	_	1-10 POF	TOPO	400	+	day	1	(8)	.67	-	The			ध							Managan
	Width		La -	=		18=1		- 4	¢t .		0.901	}			0.13							
Distance from	Initial Point																					

RATING FEET, MILE, ABOVE, BELOW GAGE, AND DISCH., STATE IN , S HRS. MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION - INTAKE FLUSHED L NO VPSTREAM WATER 60 OF@ VEL. PARTY LIT K. H. Sw 12005 WEATHER GOOL, SUNNY 301 G.H. CHANGE AIR APPROX 20 METER TYPE NATER NATION % DIFF. FROM TO STRAND STR., SIDE BRIDGE NATER N RECORD REMOVED SOUTH UNAUDA WEIR Cond METHOD 200 MM FUMN SECS FLOW LOW- UNIFORM - NOTEH post, MEASUREMENT NO. COMPILED BY CHECKED BY GAGE STAFF STATION NAME OBSERVER_ REMARKS CONTROL OTHER WIDTH DATE

	GAGE READINGS		HECORDER INSIDE OUTSIDE	2.88		3,88								
G.H. OF ZERO FLOW	GAGE R	TIME	121701	6201	13.30					WEIGHTED M.G.H.	G.H. CORRECTION	NO CONTRACTOR OF THE PARTY OF T	CORRECT M.G.H.	

	Discharge	6									177	1003										
	Area	N07			CHANNEL						1	0										
	Velocity	D MM			?						4	1										
	Seconds	20	The state of the s		10 1						35							٤				
	Hevolutions	USING	FUME		TUDAL	0					1							1		**		
	ujderi	MAED	HROATEL	11.0		10	K,	14		, 35	VAC						1	1	+			-
	\perp	WE43W	177	20		N	1 = 1	10	1	n=	FIR								+	1	1	
Distance from				1276	6	1330	(335	1340		1345	1349							1	1	1		

MEASUREMENT NO. COMPILED BY CHECKED BY	5				ō <u> </u>
STATION NAME Sauth	Cheer Ide	Sul	541/2005	** ** ** ** ** ** ** ** ** ** ** ** **	'
DATE 872559/20 WIDTH 2600 AREA METHOD AND SECS	9/26 19 57 AREA V	PARTY 76 GH.	G. G. S.	VEL. G.H. CHANGE C. IN HRS.	1 1.1
METER TYPE SPIN BEFORE MEAS. SPIN BEFORE MEAS. MEAS. PLOTS WADING. UPSTR-BOWNSTR-SIDE BRIDGE	AFTER FF. FROM SIDE BRIDGE	RATING 30 FEET, N	AILE, ABOVE, (TING FEET, MILE, ABOVE, <u>BELOW</u> GAGE, AND	<u> </u>
MEASÚŘEMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	LENT (2%), GOO OSS SECTION_	0D (5%), FAIR (8%	, POOR (OVER	8%), BASED ON	141
FLOW ZE 12 J CAN FE		WEATHER CONTRACTOR	, .	じへのり。毎日	1 1
GAGE		WATER ST	1	% © € % Q	L. 1.
RE	RECORD REMOVED		¥	U SHED L	1
OBSERVER					1,7
CONTROL CEMBERT	1011-17	4ch 600			1 1
REMARKS FC_// S	George D. C.	,			1 1
G.H. OF ZERO FLOW	egemment i delpti lähkele serre mangagan i den demon i mes et er			FT	1 1
	GAGE READINGS	ADINGS			-
TIME		RECORDER	INSIDE	OUTSIDE	1 1
					1

Discharge							35.												
Area			1136	0910	2160	092C	2 1.0		, oh:										
Velocity							40,56	6. 2	5c =									10	1
Time in Seconds		1 7	54.5	5/82.	1/28	7/65	reace	Ssill	12 tu	, ,	25 (1)	12 CF	5	22	00	, vo	0	1	
Revolutions	3 6	Ć.	1				P cell	1003	240	1 (1	1 1	. 30	13/77	1563	14.08	00	0.00		
Dapth	F/41	7		75.	52'	125	4607	2	th 01	5-, 6/1	2	. 52.	,	2	M 3	5	9	()	
Width	44						500	P +4,5	de	101	10	4 =	*					0 440	
Distance from Initial Point	800			1#	#2	F 3	Tota	16,00	Toxan				CB1					2	

FOPM31 / DEC 87

WEIGHTED M.G.H. G.H. CORRECTION

CORRECT M.G.H.

| STATION NAME | STAT

WIDTH ECC MOSECS G.H. CHANGE C. IN HRS.

METHOD /=/4/m C. NO. SECS G.H. CHANGE C. IN HRS.

METER TYPE AFTER AFTER RAS.

MEAS. PLOTS S.DIFF. FROM RATING MADING, UPSTR. COOWNSTR. SIDE BRIDGE C. CFEET, MILE, ABOVE, BELOW GAGE, AND

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

CONTROL Cemest V-notes were
REMARKS (FC-10) dass measurement
FC-11 sompling
GH. OF ZERO FLOW

 TIME
 GAGE READINGS

 TIME
 NSIDE

 NOTSIDE
 OUTSIDE

 WEIGHTED M.G.H.
 G.H. CORRECTION

 CORRECT ING.H.
 CORRECT M.G.H.

Discharge							,00%	527	/	1											
Area		1,00	i	22	5/5/	V/U/	11		2,90	0.11			1	(4)							
Velocity							7		111	746			Ì	1/8	CFS						
Time in Seconds		5.40	1777	11161	1723	1727			Jetts	110		= .78	!	N	1727						
Revolutions	unc						fret		7 2	FH	V	,53,		1201	11						
Depth	o E	4/4	' I `	0/2	3/.	4/.	440		zese	+40		-,50	7	1"1	1:= 4						
Width	our o						2	1 17	ot v	10/0	2	`	10	1			10-				
Distance from Initial Point	20		7	#	#2.	* N	70 /2	1 1	60	Take						- 1	CA				

MEASUWEMENT NO. COMPILED BY CHECKED BY
STATION NAME 540 1200 78 14 40024
DATE 89272 9/29 ,19 89 PARTY 500 703 WIDTH AREA VEL. G.H. MORE DISCH. 1/1
METHOD A CHANGE IN HRS.
NETER TYPE SPIN BEFORE MEAS. AFTER MEAS. PLOTS WADING. UPSTRACKWISTRY SIDE RRINGE WAS WADING. WAS WADING. UPSTRACKWISTRY SIDE RRINGE WAS WADING. WAS WADING. WAS WADING. WAS WADING. WAS WADING SIDE RRINGE WAS WADING. WAS WADING WADING WADING SIDE WAS WADIN
N N
FLOW WEATHER Clear WAS - M
OTHER AIR F@
GAGE WATER oF@
RECORD REMOVED INTAKE FLUSHED L
OBSERVER

FT		OUTSIDE						
		BUSIDE						
	ADINGS	RECORDER						
	GAGE READINGS							
FLOW						I.G.H.	NOILC	.G.H.
G.H. OF ZERO FLOW		TIME				WEIGHTED M.G.H.	G.H. CORRECTION	CORRECT M.G.H.

Discharge							-		150%														
Area			Time	1700	1705		1710		3e =		106,		7.9	1									
Velocity									e tu		111 =		-///			10	270						
Time in Seconds			C. FS	1007	.1137		11137		المراجات		at A	•	010		27. =	119	1137						
Revolutions	2 4								of cet		C XC	0	F H. O	kı .	500	,76	1						
Depth	Fle		A	1/3	61.		17/-		2014	>	15e X		116		1001	- 106	11/1 3						
Width	8 8								1/6	K	of X		16	0		 5,	8					·	
Distance from Initial Point	200			#/	#2	1	#3		Tet		100		10 Ka-1										

REMARKS CALLA

CONTROL

G.H. OF ZERO FLOW_

RATING - 7 FEET MILE ABOVE, BELOW GAGE, AND MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION HRS. G.H. 12en C. DISCH. 10 占 807/ OF INTAKE FLUSHED L ≥' eg. massaren (1) AH 60. Apitorn WEATHER Clear G.H. CHANGE AREA VEL. G. SW12008A WATER RECORD REMOVED METER TYPE
SPIN BEFORE MEAS. ** DIFF. FROM
MEAS. PLOTS ** DIFF. FROM
WADING, UPSTR. DOWNSTR. SIDE BRIDGE ___ allas 16 ZCO ~ MARCA REMARKS (72,00 STATION NAME 5 87272 MEASUREMENT NO. COMPILED BY CHECKED BY G.H. OF ZERO FLOW 10-11 OBSERVER CONTROL METHOD OTHER DATE WIDTH FLOW GAGE

מיווי פו דרווסו רסוו				-	
	GAGE READINGS	ADINGS			
TIME		RECORDER	INSIDE	OUTSIDE	- 1
					-
			·		
					1
WEIGHTED M.G.H.					
G.H. CORRECTION					-
CORRECT M.G.H.					

Discharge		3)				10%		Q.						
Area		Tim	0/2/	5/9/	5191	\c = \	, 50	,28						
Velocity						e tu	11/2	3/1/2		2)				
Time in Seconds	J	CAS	5883	1001.	1007	Com	5 70	2011	.77	136	7 CF3			
Revolutions	Luca					J. C.	40	2426	3	77 =	,/00			
Depth	7 1,4	404	,/5/	1/3	13	34.70	Se X	140	5, - "	, _ / 0	./3=			
Width	, (a)					1/61	St tu	dry	1,0	, 50	4=			
Distance from Initial Point	200		#/	#2.	#3	7012	162	Total						

MEASUREMENT NO. COMPILED BY CHECKED BY	
STATION NAME SEWAGE TREATMENT PLANT SW24001	
DATE \$9.03 19 РАВТУ 1.8 164 1005 WIDTH NUTH G.N. 1.19 DISCH 0.005	
~!	
METER TYPE ALORS NA AFTER NA RATING WADING, UPSTR., DOWNSTR., SIDE BRIDGE ALORS AND RET, MILE, ABOVE, BELOW GAGE, AND	
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	
FLOW LOW-UNFFORM WEATHER COOL, PT CLOUDY	
отнея AIR AIR 1 0 0	
GAGE NONE WATER 1000 OF 1100	
OBSERVER	
CONTROL	
REMARKS USED FUCKET METHOD TO FIGURE	
84	

Discharge	Tan										
Агва	MPLES				a			,	2007		
Velocity	47 60			57	18		Grand m.	300	900		
Time in Seconds	adie	ANB.	No	5746 8	Flow AT		2,5	7.18	200	1 1 1	
Revolutions	FROM !	SAMPLING	S S	7.4		7		7700	60		
Depth	1000 FR	SAM	8.	F52	ENETOI	0006	5	1 17	Ft/m1		•
Width	FLO	30	<i>y</i>	1 6	HL	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	2.5 GA]	.334 CL		
Distance from Initial Point											
4202	M24001 DISCH. 0.005 IN_HRS.		"%), BASED ON	0011	TED L No		2B	FT	OUTSIDE		

INSIDE

RECORDER

GAGE READINGS

¥

G.H. OF ZERO FLOW_

TIME

WEIGHTED M.G.H. G.H. CORRECTION

CORRECT M.G.H.

RATING 70.74 FEET, MILE, ABOVE, BELOW GAGE, AND MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION ACCOUNTY z 9/37/89 19 59 PARTY GPP TG SEG AREA AMA VEL. 4MA G.H. AMA DISCH. MM AIR: 85 4@ 1430 119- NONG TNSTALLED WATER 22,3 % 1430 Seusge Treatment Plant U INTAKE FLUSHED L FLOW MED. - NOW ON THORM WEATHER JOUTLY CLOUDS G.H. CHANGE RECORD REMOVED 11/7 METER TYPE UM AFTER WAS PLOTS WADING, UPSTR., DOWNSTR., SIDE BRIDGE NO. SECS LIF STATION NAME SWAYCOL Volomotric MEASUREMENT NO. COMPILED BY CHECKED BY 2832 OBSERVER SEC METHOD OTHER WIDTH GAGE

CONTROL NOWE - RETURNING BASING REMARKS DELUMBE TRT REFLUENT - WATER

G.H. OF ZERO FLOW

TIME GAGE READINGS

RECORDER INSIDE
OUTSIDE
WEIGHTED M.G.H.
G.H. CORRECTION
CORRECT M.G.H.

Decharge	B							F.D. S.C.							
Area.							ZEICL	K-45 20 21 175							
Velocity	1						21 4171	750C							
Time Ja-	1 1 4	71.7	- j.h.j.	1404	1465	1001	(1 72	Disceil							
Revolutions	< cho	Describerto	38 8%	36.5ec	18 sec	14000	12150	T-21C							
Depth	C V	N 95	per	Not.	ner	ANI	17	17-14 1 F 17-17							
Width	senot v	4901	492	100 H	4 gal	yesh	E	<u> </u>							
Distance from Initial Point	101													1	

DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

84 H3 MEASUREMENT NO. COMPILED BY CHECKED BY

4-6-19 89 PARTY LB 72 AREA 3.537VEL. 2094 G.H. 6.47 DISCH. 0.323 IN & HRS. NOPTH FIRST CREEK (SW77773) METHOD WETER NO. SECS 30 3/ GH, CHANGE 6.00 STATION NAME WIDTH DATE

METER TYPE 1-76-717 62.5 SPIN BEFORE MEAS. 48 AFTER 45 MEAS. PLOTS 8 DIFF. FROM RATING MADING, UPSTR, DOWNSTR.) SIDE BRIDGE 40 REET MILE, ABOVE, BELOW GAGE, AND # 625 PYGMY

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

INTAKE FLUSHED L NO 1530 FLOW LOW- MODERATE WEATHER WARM, SUMUY, WINDY OTHER WIND RIPPLING SURFACE AIR 65 WATER 50 5 RECORD REMOVED 40' UPSTREAM GAGE STAFF

OBSERVER

REMARKS APPLOX 40 POWNSTREAM, AREA FULL OF -NOTCH WEIR 1 35' UPSTREAM VEGETATION, VEG REMOVED - NO EFFECTS CONTROL

G.H. OF ZERO FLOW

0.09

	GAGE READINGS	ADINGS		
TIME		RECORDER	INSIDE	OUTSIDE
0151		0.47		0,47'
1522		6.47		0.47
025/		0,47		0.47'
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.		0.47		0.477

5= 1510	7 - 1530
" " " " " " " " " " " " " " " " " " "	= 9,15
	LEW =
`	74

Discharge	0.000	0,000	0.000	0.000	0.000	0.00	0.000	0,000	0.017	1600	0.086	0.052	0.044	0.014	0.013	0.000	0.000	0.000	0.000	0.000	0.000
Area	0,042	0.099	0.136	0,153	0./80	0,210	0,23/	0.840	0.352	94C.0	0.234	0,235	0.333	0.210	0.189	0.171	0.150	0.147	0.120	0.087	0,000
Velocity	0000	000	0000	0000	0.000	0.00	0000	axo	0,067	0.367	1367	0.233	0.200	0.067	0,067	0.033	0.000	assi	0.00	0.000	0.000
Time in Seconds	Ø	8	30	30	30	જ	R.	30	30	30	30	3	30	30	30	30	30	B	30	30,	\mathcal{B}
Revolutions	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	8	11	1/	7	9	6	B	1	Ø	Ø	Ø	Ø	Ø
Depth	800	.33	.42	.5/	09,	.70	,77	.80	18.	,83	.78	1.75	174	02'	.63	.57	.50	94,	04'	129	00.
Width	9/'	,30	30	.30	130	.30	.30	,30	.30	.30	æ.	.30	.30	.30	.30	.30	.30	.30	.30	,30	5/.
Distance from Initial Point	3.15	345	3,75	4.05	4.35	4,65	4.95	6,25	5.52	5.85	6.15	6,45	6.75	7.05	7.35	7.65	7,95	8,25	8,55	8.85	9.15

FINISH -

Beh 4/21/89

3 4/21/00

MEASUREMENT NO. COMPILED BY CHECKED BY STATION NAME 24002 NORTH FIRST CAREET

DATE 89111 4/21 19 59 PARTY C. 400 SLOCK
WIDTH 6.3 AREA 8.705 VEL. 1.35 G.H. 047 DISCH. 313
METHOD 6 NO. SECS 40 Cach G.H. CHANGE + 0.01 IN /2 HRS.
METER TYPE

STATION NAME

AREA 9.00 IN /2 HRS.

METER TYPE SPIN CALLY TO THE TOTAL #625 NO.
SPIN BEFORE MEAS. 31 AFTER HE
MEAS. PLOTS
WADING, UPSTR., POWNISTR, SIDE BRIDGE HO S.
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

FLOW ADA MATGETTY TOWN WEATHER SUNNY 75°F SLIGHT BREEZE OTHER

OTHER

GAGE STEVENS TYPE F, GAGE WATER HO "F" 10 45

NO RECORD REMOVED NO INTAKE FLUSHED L

OBSSERVER PAUL WHITE JULIE STEPHENS

consistently edge; measurement STRUCTURE) meter CONTRUL right will not (CEMENT 0 Flow IOW flow WEIR REMARKS Higher G.H. OF ZERO FLOW suspect as CONTROL_

OUTSIDE 41.0 0.46 14.0 0.47 1410 0.47 INSIDE 4.0 0,46 RECORDER GAGE READINGS FINISH START G.H. CORRECTION CORRECT M.G.H. WEIGHTED M.G.H. TIME 1056 1128 150 POST 6111

					-	7	2/12/1	-						1				,¥							
	Discharge	C	C	62	o	J	,0525	1.0427	10434	3540.	1440,	0440.	52 hah o.	0	0	0	1	1	1200						
***************************************	Area	.025	,200	4555	2130	4	,300	,244	342,	.200	252	022	LH1.	621	.074	.0015	1	2,705							
	Velocity	0	0	O ver.	alizia O	7.48	175	.175	175	115	175	,200	275	0	0	0		1	1357	7					
	Time in Seconds	04	40	40	0/1	OH	OH	04	40	07	40	40	40	40	40	04									
	Revolutions	0	0	0	0		6	L	7	7	7	8	11	Û	0	O									
	Depth	0.05	07'0	ı		09.0	0.60	10.0	0.62	0.65	0.63	0.55	0.42	14.0	82'0	0.05									
	Width	0,5	0.1	100 Jan	20 + CE		6'0	4'0	4.0	6.4	4.0	0.4	0.35	6.0	6.0	6,15									
	Distance from Initial Point	7.8		2-	42		4.8	4,4	4.0	3.6	3.7	2.8	7,4	1		5.1									

	1
#	<u> </u>
STATION NAME NORTH 131 OREGIN (5W 34002)	
DATE 123 MAY 3 19 89 PARTY MY JIC NISCH 1079	
G.H. CHANGE	1 1
NA	1
MEAS. PLOTS WADING, UPSTR. COWNSTB, SIDE BRIDGE 30 (FEE), MILE, ABOVE (BELOW GAGE, AND	17
MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	
FLOW UN GORM WEATHER SUNNY	
OTHER SIR - 605 40	1
CLEAR WATER 503	1 1
N	
OBSERVER	
CONTROL CLEGAR	
REMARKS MEDSYCING Q W/TIME	
	1

G.H. OF ZERO FLOW				FT	
	GAGE READINGS	ADINGS			
TIME		RECORDER	INSIDE	OUTSIDE	
1005	BEFORE	0.52		0.52	
1020	DURING	0.52		0.57	
1029) (0,52		0.52	
1030	11	0.52		652	
•					1
WEIGHTED M.G.H.					
G.H. CORRECTION					
CORRECT M.G.H.		0.52		0.52	

			Ω										
Discharge			docop										
Area	0.76	0,79	61.0										
Velocity	3	9,0	8			6							
Time in Seconds	600	8	2			0.7							
Revolutions	0.4	0. 4	0,4			9							
Depth	2) =	2) =	2 (2)			FINAL							
Width	Y) Y	N										
Distance from Initial Point	(670)	1025	(030										

,	64 25 2 DISCHB 35 45	IN HAS	45 ST SELOW GAGE, AND	O.	59 0560		USHED L MO	
700	1/5 19 89 PARTY D, S GK 23 AREA 1.966 VE. 1.375 GH. 0.972 DISCHB.3545	G.H. CHANGE	ANY RATING FEET, MILE, ABOVE (SELOW GA)	%), FAIR (8%), POOR (OVE	WEATHER 6001, CLOUDY 45°	H 45°	₩0 INTAKE FLUSHED	
WORTH THOUSE	5/15 19 89 AREA 1.986 VE	2	326	SELLENT (2%), GOOD (5°	1	STAFF - 6000 CONO.	RECORD REMOVED	
j Z	DATE 64(35)	метнор · <i>6</i>	METER TYPE GURLEY 675 SPIN BEFORE MEAS. 77 MEAS. PLOTS COWNSTR. SIDE BRIDGE	MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED FOLLOWING CONDITIONS, CROSS SECTION	FLOW MOD - UNE FORM OTHER		OBSERVER	
200 4	, 05	Σ	≥ ∞ ≥ ≥	ΣŒ	ii o	Ø	Ιō	•

	Grown.
	まち
	20405
Oicel	Scilos di HA
CONTROL	REMARKS

TIME GAGE READINGS TIME RECORDER INSIDE CUTSIDE 0930 BEFORE 0.93 10.15 '' 0.93 10.21 STARI 0.92 0.92 0.92 10.41 END 0.92 WID 0.92 WID 0.92 WID 0.92 WID 0.92 WID 0.92 WID 0.93 WID 0.9	G.H. OF ZERO FLOW				Ξ
BEFORE 0.43 '' 0.43 STARI 0.42 MID 0.42 END 0.42		GAGE R	EADINGS		
BEFORE 0.43 '' 8.43 STARI 0.42 M.D 0.42 END 0.42	TIME		RECORDER	JOISNI	CUTSIDE
STARI 0.43 MND 0.92 END 0.92	0430	BEFORE	0.43		0.93
STARI 0,92 MID 0,92 END 0.92 0	10/8	1)	86.0		0 02
0 N	1021	STARI	26.0		0.97
	1030	Q1W	760		6.47
WEIGHTED M.G.H. G.H. CORRECTION CORRECT M.G.H.	1041	END	20.0		0.92
WEIGHTED M.G.H. G.H. CORRECTION CORRECT M.G.H.					
G.H. CORRECTION CORRECT M.G.H.	WEIGHTED M.G.H.				
CORRECT M.G.H.	G.H. CORRECTION				
	CORRECT M.G.H.		-		

Discharge	0	193	257	317	236	246	422.	374	.672	12/2	225	044	036	C		5.200											
Area	0	660.	156	68/	1.89	189	,183	081	,201	,219	1/80	126	5601	0		1.9xc	5										
Velocity	0	1.75	1,65	1.675	1.25	1.30	1.225	2,075	3,35	2.475	1.25	9,35	0.475	0		1.345											
Time in Seconds	Ø	0 ty	40	40	40	40	40	40	40	5	40	40	40	Ø													
Revolutions	Ø	10	90	49	20	25	40	83.	134	66.	20	14	6)	0					-								
Depth	0	.33	152	,63	,63	,63	10.	,60	162	73	8	74	25	0													
Width	115	130	.30	.30	,30	.30	30	20	.30	,30	,30	.30	3	3													
Distance from Initial Point		3.3	W	3.0	4.2	54.5	4.8	5.1.	5.4	5.7	3	6.3	3 66	6.9	•							-					

PREEK - NORTH BOUNDARY - SWIM DISCH. 147 IN O HRS. Z J.K. G.H. CHANGE PARTY VEL. 98 er, 46/4 NO. SECS NA 1 AREA F. R5T 4114 FLUME ~6.0 MEASUREMENT NO. COMPILED BY CHECKED BY STATION NAME WIDTH 200 mm METHOD DATE 900 25

RATING FEET, MILE, ABOVE, BELOW GAGE, AND MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION 1000 INTAKE FLUSHED L ₽, @ °F@ 4000 AIR . 65 WATER 55 WEATHER COOL RECORD REMOVED METER TYPE ASS. N.A. AFTER SPIN BEFORE MEAS. N.A. AFTER MEAS. PLOTS % DIFF. FROM WADING, UPSTR., DOWNSTR., SIDE BRIDGE. INSTALED FLOW LOW / UNIFORM NONE OBSERVER OTHER GAGE

CONTROL

REMARKS FLOW NOT STEADY, BACKIUS UP DUE TO
STHALLOW FANKING STRUCTURE

G.H. OF ZERO FLOW

 GAGE READINGS

 TIME
 RECORDER
 INSIDE
 OUTSIDE

 WEIGHTED M.G.H.
 G.H. CORRECTION
 CORRECTION

Discharge																						
Area		INME	SIPE																			
Velocity		y 02	Low A																			
Time in Seconds		THROAT	BE TO	METHOD)					525								
Revolutions		LONG-	MAY	THIS MY			aub		.740	1/27	1/00		1110	110								
Depth		155NB	-84NK	FOR			2 5		- R					u								
Width		1 O				0/	44	2	1-10	1	111		1	3								
Distance from Initial Point	ta a						141	101	101													

FOPM31 / DEC 87

	Distance f					7	t					
MEASUBEMENT NO.	COMPILED BY CHECKED BY	STATION NAME [ST CREEK & NORTH PLANTS (SW30003)	DATE 89114 454 19 89 PARTY JK, UB	~ 12 dt AREA	METHOD FLUME NO. SECS NA G.H. CHANGE NA IN HRS.	MEAS. WA AFTER WA	WADING, UPSTR., DOWNSTR., SIDE BRIDGE FEET, MILE, ABOVE, BELOW GAGE, AND	MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	FLOW LOW - UNIFORM WEATHER LOOL, CLEAR, LT WIND	ОТНЕЯ . 60 + 60 т. 60	GAGE NOWE INSTALLED WATER 50 OF 1145	D BECORD REMOVED MIAKE CHIRCLE A

CONTROL					
REMARKS	REEDS	AND VES	ETATION	10-15'	REEDS AND VESETATION 10-15' UPSTREAM
G.H. OF ZERO FLOW	HOM				14
		GAGE READINGS	ADINGS		
TIME			RECORDER	INSIDE	OUTSIDE
WEIGHTED M.G.H.	3.H.				
G.H. CORRECTION	NOI				
CORRECT M.G.H.	i.H.				

FOPM31 / DEC 87

Discharge																				
Årea																				
Velocity	FUUME		,							ې	`									
Time In Seconds	CATED			1.400	.580		220			V	2									
Revolutions	THR			7	10	\	9	5		111/	1.01.									
Depth	9N07 0			705	30															
Width	11SE	-		1	1 70	,	= 1			5	ナノ									
Distance from Initial Point				101	101															

OBSERVER

MEASUREMENT NO.
COMPILED BY
CHECKED BY
STATION NAME ANSWA

3600

METER TYPE NA SPIN BEFORE MEAS. NA A SPIN BEFORE MEAS. NA SPIN BEFORE NA SPIN BEFORE, BELOW GAGE, AN A SPING WADING, UPSTB., DOWNSTR., SIDE BRIDGE FEET, MILE, ABOVE, BELOW GAGE, AN HRS. MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION WEATHER CLOUDY, SYDICIONAL PRICE 2 INTAKE FLUSHED L NO Fre CA35 40 CA35 DISCH. Z 19 SSZ PARTY TC4, SE GO (2010) AIR. V 65 WATER CO G.H. CHANGE NO. STATE THE C (COUCENE) RECORD REMOVED SEPTEMBER 29 METHOD BUCKET / MIRONO, SECS FLOW LOND, WINTERKAL OBSERVER GAGE OTHER DATE 166331

CONTROL LINETAL V MOTCH LOCKR

G.H. OF ZERO FLOW

 GAGE READINGS

 TIME
 RECORDER
 INSIDE
 OUTSIDE

 WEIGHTED MG.H.
 CORRECTION
 CORRECTION
 CORRECT M.G.H.

DISCHARGE MEASURE MENT WITH BUCKET + TIATER, MEASURED SUST BEZOND WEND

VCL.		H BAL	11 1/2 11	7 241	4 6×0		adbur do	245	58 ofe	1										
Area						1	1		= 0.015g	2										
Velocity						76 22	100	2000												
Time At-		43	17) T	20 2		4	625,79	200										
Revolutions						inabana														
Depth						din	444				-							`"		
Width		14	7#		#3															
T1/L(C Distance from Initial Point		0935		·								•								

FOPM31 / DEC 87

5/APF 1436 FZN 15H-

R. L. STOLLAR & ASSOCIATES

DISCHARGE MEASUREMENT NOTES WASUREMENT NO. WY 894 445 を30 88102 MEASUREMENT NO. COMPILED BY CHECKED BY

DISCH. 1285 37001 LB, 5K 4-7-1989 PARTY 6B, 5K AREA 1.329 VEL. 338 GH. 51 CREEK OFF-POST FRIETER NO. SECS 14 FIRST 1.6068 4.00 STATION NAME DATE WIDTH

IN COHRS. PYSMY CURRENT METER G.H. CHANGE % DIFF. FROM 809 A METER TYPE 6U/ SPIN BEFORE MEAS.

METHOD

MEAS. PLOTS

WADING UPSTRADOWINSTRY SIDE BRIDGE

WADING UPSTRADOWINSTRY SIDE BRIDGE

OF STORY

MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION

WEATHER WARM, WINOUY, O'LERCAST NONE INTAKE FLUSHED L NO 1450 1450 40 AIR 600 WATER 50° RECORD REMOVED FAIR CONO FLOW LOW-MOD GAGE STAFF-OBSERVER OTHER

WORKING - UNDERFLOW ROD SINKING 508 BOTTON VERY NOT # - FLUME STREAM REMARKS CONTROL

G.H. OF ZERO FLOW

H

GAGE P	GAGE READINGS		
TIME	RECORDER	INSIDE	OUTSIDE
1435	NONE		0.51
LHH1	MONE		0.51
/453	NONE		0.51
	-		
WEIGHTED M.G.H.			
G.H. CORRECTION	×		
CORRECT M.G.H.	Q		0,5/

×	Width	Depth	Revolutions	Time in Seconds	Vetocity	Area	Discharge
, 0	30	Ø	Ø	30	0,000	0.000	0.000
\mathcal{S}_{i}	0	46,	Ø,	30	0.00	0.02	0,000
.30	0	130	Ø	30	0,000	0.000	0.000
30	0	38.	Ø	30	000	0,105	0000
143	30	,35	.80	30	0.367	0.105	0.038
,30	0	,38	91	30	0,533	6/1/4	10.00
ω	30	.38	13	8	0.400	0.114	0.046
1.0	30	16'	15	30	0.500	0.133	0.061
ű,	.30	,33	6	30	9300	0.099	0.030
ú	30	134	6	30	0.30	0.102	0.031
1	Q	,32	6	30	0,300	0	0.039
63	.30	138	B	.30	0,00	180,0	0.000
13	0	139	Ø	30	0,00	1.087	0000
10	0	6/ '	Ø	30	0.000	0.038	0000
							1
					222		0.285
					0.0	1,229	

FOPM31 / DEC 87

76

5.57

SPIN BEFORE MEAS. 3.9 AFTER ARME MEAS. PLOTS % DIFF. FROM RATING WADDING, VESTR. DOWNSTR., SIDE BRIDGE 3.0 FEET, MILE, KROVE, BELOW GAGESAND DISCH. 0.308 MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION HRS. ~ 80°F INTAKE FLUSHED L NH 1645 1645 CREEK -OFFPUST 3700 Z -107 XB 465 G.H. 0.52 DBC WEATHER WAKM, BREEZY oF@ . 4@ _ ž G.H. CHANGE AIR 80 WATER シャ neter RECORD REMOVED F1857 round house record NO. SECS_ AREA FLOW Low - uniterm STATION NAME NUKTH METER TYPE (Y 25" Y SPIN BEFORE MEAS. 3 7 2 01168 MEASUREMENT NO. COMPILED BY CHECKED BY Ċ. 111 GAGE STRAFF OBSERVER METHOD OTHER DATE WIDTH

Annual contraction of the latest and				
	GAGE READINGS	ADINGS		
TIME		яесоврев	INSIDE	OUTSIDE
8 + 91				0,52
1704				0,52
17:14				0,52
WEIGHTED M.G.H.				
G.H. CORRECTION				
CORRECT M.G.H.				

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						•																					
Discharge	1	20.00	0.031	0.033	0.040	0.050	0.040	0.043	0.048	0	0000	0000	0.00	0.00				308									
Area	0000	0.00g	6.070	0,066	0.066	0.066	0.063	990.0	0.066	0.00	6900	6003	0.045	18	J		1	£.									
Valocity	0.000	0.000	0.300	0.500	0,600	0.750	0.625	0.650	6.725	0.500	0.000	0.000	0.000	0.00		1	485										
Time in Seconds	40	40	40	40	24	700	40	40	40	3	40	40	3	10													
Revolutions	0	0	12	20	24	30	25	36	5-6	70	0	0	0	0											-		
Depth 1		120 EV.	.23	, 22	.22	.22	12.	.72	.22	. 22	.23	17,	15	Ó													
Width	517	. 30	, 30	. 30	30	, 30	, 30	.30	B	Æ,	,30	30	A. 30	DE 230	51.												
Distance from Initial Point	3,7	4.0	4.3	4.6	4.5	5.2	5,5.	5.3	6.1	6.4	4.7	7.0	3	7.6													-

FlumE

NOWFUNCTIONAL

CONTROL

G.H. OF ZERO FLOW

FINISH =

R. L. STOLLAR & ASSOCIATES DISCHARGE MEASUREMENT NOTES

		1 1		2	7 ,	0	1		,			12	
,			HRS.	AGE, A	ASED O	9 17	355	1055				3 h	
	37001	DISCH.	_i ≥ 	ELOW	8%), B	D	10	10	SHED 1			AMMC	
`	3	88		NG NILE (ABOVE, BELOW GAGE, AND	(OVER	WEATHER CODIL, SL COUDY, LT 10 ME	.65° F@	55° 0F@	U INTAKE FLUSHED <u>L</u>			7710	
		X F	VGE	MILE (AE	, POOF	35	.65	55	INTA			S	
	50d	VEL. G.H.	G.H. CHANGE		AIR (8%	700	AIR	WATER				230	
	SEF.	PAR EL.	g	RATI	(5%), F	ER 💪						NO	
1 1 1	MORER GFF-POST	98 61.	17.4	METER TYPE N'A AFTER N'A MESS. PLOTS " DIFF. FROM MEAS. PLOTS " DIFF. FROM WADING OF STE, DOWNSTR., SIDE BRIDGE 40	MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION	WEAT		-6000 STARPE	OVED		:	FLOW UNDER STATIONARY FLUI	
M	POLE		SS	AFTER FROM DE BRIDO	T (2%),	5		2	RECORD REMOVED			12	
141	7	AREA	NO. SE	AFTER W. DIFF. FROM STR., SIDE BRID	CELLEN	JOG		1005	RECOF			News -	
	FIRST	6	72t	S. A. S.	TED EX	CA		- 1				ON	
MEASUREMENT NO. COMPILED BY CHECKED BY	¥	66/63	METHOD 200 MM 12 UNG. SECS 10/4	METER TYPE NEAS. — WEAS. — MEAS. PLOTS WADING (UPST), DOW	MEASUREMENT RATED EXCELLENT (2%), GO FOLLOWING CONDITIONS: CROSS SECTION	FLOW LOW UNIFORM		STAFF				र	
MEASUHEMEN COMPILED BY CHECKED BY	STATION NAME	7 1	00	METER TYPE SPIN BEFORE MEAS. PLOTS WADING OPS	UREME	7	æ	- 1		OBSERVER		P. P.	2
MEAS COMF CHEC	STATI	DATE	METH	METE SPIN MEAS WADII	MEAS	FLOM	OTHER	GAGE		OBSE		CONTROL	0

2													
La Lad Im		FT		OUTSIDE	101	0.51	95'0	0,56	0.3	0.58			-
2011/6				INSIDE									
L' con ONORIO D'ILLOWING L'ON			DINGS	RECORDER	.500	000	500	500	500	055	٠		6.66
1. 101			GAGE READINGS										
7.100													
CONTROL	REMARKS	G.H. OF ZERO FLOW		TIME	1CH5	1054	1059	1104	1109	1114	WEIGHTED M.G.H.	G.H. CORRECTION	COBBECT M G H

									J.							
Discharge	46	87	2	67	40											
Area	4/4	0438	114' =	163	+ .54											
Velocity	-01	10	10	10	0											
Time in Seconds	20 st	4.18	485	\$	#		300			-ahh	-					
Revolutions	- 0:	, O,	<i>- 0.3</i>	0.34	-0.33		10.			9	3					
Depth	(z)	(2)	(2)	(2)	2		05.	89123				2				
Width	4	7	1	h	110		1					TANK I	•			
Distance from Initial Point	10401	1059	K011	1109	4114		10	10	3							
	 		5	<u> </u>	0				2			T 1		1 1		_

095 = OUT OF SERVICE

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DISCHARGE MEASUREMENT NOTES R. L. STOLLAR & ASSOCIATES

RATING GEET MILE, ABOVE BELOW GAGE, AND 6.58 DISCH, 0,0753 MEASUREMENT RATED EXCELLENT (2%), GOOD (5%), FAIR (8%), POOR (OVER 8%), BASED ON FOLLOWING CONDITIONS: CROSS SECTION PARUER INTAKE FLUSHED LINO 1545 WEATHER WARM, MOSTLY SUNNY S/5/ @+ 9. 0. AREA 19 89 PARTY OK, 13 G.H. CHANGE AIR 85 WATER 65 FIRST CREEK OFF-POST MEAS. PLOTS # DIFF. FROM WADING DIPSTR. DOWNSTR., SIDE BRIDGE 10 RECORD REMOVED G000 COND ź METHOD 100 MM LT NO. SECS XX FLOW YERY LOW-UNIFORM GAGE INSIDE STAFF -METER TYPE NATIONAL N 89/94 MEASUREMENT NO. COMPILED BY CHECKED BY STATION NAME OBSERVER DATE WIDTH OTHER

CONO 6000 FLUME 5 0.20 STRUCTURE CEMENT REMARKS. CONTROL

G.H. OF ZERO FLOW

GAGE R	GAGE READINGS		
	RECORDER	INSIDE	OUTSIDE
	0.58	0.78	-
	85.0	0.58	

Discharge		1																	
Area		200																	
Velocity	1	1			193	53)	1,0/53											
Time in Seconds			C.	2/	0.0153	0.0/53		0,0				-	2						
Revolutions			100	30	6,42	64.0		0.43				7	0.0						
Depth				2/	900	0.00	7 (7)	0,00				- NA	5						_
Width																			
Distance from Initial Point			1	A A	inte	(141)		154											

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APPENDIX A-3

Rating Curves

APPENDIX A-3.1

Rating Curve Development Procedures

Appendix A-3.1 Rating Curve Development Procedures

Channel Control Rating Development. - The development of the rating curve for a channel control station would normally use a graphical analysis of discharge measurements plotted on logarithmic graph paper. Upon review of the discharge measurements, made prior to the 1989 water year, for the only channel control station, Havana Interceptor, all were rejected as unreliable for rating curve development. Therefore, the following analysis was performed to derive a rating curve for Havana Interceptor:

- A normal depth hydraulic analysis was performed using HEC-2 to predict gage height and corresponding discharges from channel geometry.
- The predicted discharges and gage heights were plotted on logarithmic paper. The discharge was on the ordinate and the gage height was on the abscissa.
- A curve of connected straight-line segments was visually fitted through the plotted points.
- Endpoint coordinates of each straight-line segment were determined from the rating curve plot. A rating equation was derived in the form of a power curve (Rantz 1982).

The rating equation was of the form

 $Q = pG^N$

where

Q = discharge in cubic feet per second (cfs);

G = the gage height of the water surface in feet;

p = regression coefficient (dimensionless); and

N = regression coefficient (dimensionless), generally not equal to p.

Two different criteria were used to confirm the permanence and/or follow shifts in the rating curve for Havana Interceptor. These criteria are as follows:

- Instantaneous discharge measurements made during the 1989 water year must be within ± 5 percent of the rating curve discharge corresponding to the same gage height in order to confirm the permanence of the rating curve.
- For low-flow measurements, the ± 5 percent criteria may be too stringent because of station control insensitivity; therefore, departures greater than ± 5 percent are

acceptable and confirm the permanence of the rating curve if the indicated shift in stage does not exceed 0.02 feet.

A detailed analysis of each instantaneous discharge measurement made during the 1989 water year at this station is presented in Appendix A-5.

Section Control Rating Development. - Laboratory-rated discharge-measurement structures have been installed at seven RMA stations (Highline Lateral, Ladora Weir, Basin A, South First Creek, North First Creek, First Creek Off-post, and South Plants Ditch). These structures provide section control for the complete range of stages falling within the capacity of each structure. Each artificial control stabilizes and constricts the channel at a section, and thereby simplifies the procedure for obtaining accurate records of discharge. Although these structures have been built in conformance with the dimensions of laboratory-rated weirs or flumes (the relationship of stage to discharge has been carefully measured under controlled conditions) differences between the model and prototype invariably exist, if only in approach-channel conditions (Rantz 1982). Therefore, instantaneous discharge measurements were made at artificial section control stations to verify the rating curves prepared for the respective model structures.

It should be emphasized that the primary purpose of the weir structures, and the triangular-throated flume at the First Creek Off-post station, was to measure flows within the capacity of the structures. Therefore, no attempt was made to determined the relationship of stage to discharge for stages and flows exceeding the capacity of the artificial section controls.

The laboratory rating for each structure was plotted along with the discharge measurements to discharge if a correlation existed. These laboratory ratings are based on depth of water above the zero-reference of the structure. Since the field-measured staff gage heights do not generally equal the water depths above the zero-reference of the structures, an offset was subtracted from each staff gage height to obtain the plotted depth value. This offset (e) is the gage height (in feet) corresponding to zero flow for the existing control. If the discharge measurements consistently plotted on the empirical rating curve, the empirical curve was used. For stations at RMA requiring modification of the empirical ratings, the verified stage-discharge measurements were plotted, and connected straight-line segments were fit to the plotted points. Regression analysis to fit a power curve was performed as previously described (Channel Control Rating Development) to obtain a calibrated rating curve and rating equations for the existing condition of each structure. For the stations where zero on the staff gage does not correspond to zero flow, the rating equation will be of the form

$$Q = p(G-e)^N$$

where

Q = discharge in cubic feet per second (cfs);

- (G-e) =head or depth of water on the control in feet;
- G = the gage height of the water surface in feet;
- e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;
- p = regression coefficient (dimensionless); and
- N = regression coefficient (dimensionless), generally not equal to p.

Confirmation of the permanence of these rating curves followed the same criteria as previously described in Section 3.1.2.6, Rating Curve Development Procedures; and in this Appendix, Channel Control Rating Development.

The development of the rating curve for South First Creek followed the normal graphical analysis of instantaneous discharge measurements. The reliable instantaneous discharge measurements were plotted on logarthmic graph paper with the discharge on the ordinate and the corresponding gage height on the abscissa. A curve of connected straight-line segments was visually fitted through the plotted points. Endpoint coordinates of each straight-line segment were determined from the rating curve plot. Regression analysis to fit a power curve was performed, as previously described (channel control rating development), to obtain a calibrated rating curve and equations for the existing condition of the structures. The rating curve required extrapolation beyond the range defined by discharge measurements for low flows. A table of gage height and discharge was generated by using the rating equation in the defined region for the lowest flows. These points were plotted on rectangular-coordinate graph paper along with the gage height of zero flow, and a smooth curve was drawn to merge the point of zero flow with the defined range of points (Rantz 1982). Several points from this extrapolated curve below the defined segment were transferred onto the logarithmic paper. Straight-line segments were connected between selected extrapolated points and equations were derived for the segments as previously described.

Upon review of the four instantaneous discharge measurements made at the North First Creek gaging station, only one was accepted as reliable for rating curve development. Therefore, the following analysis was performed to derive a rating curve for this station:

- A normal depth hydraulic analysis was performed using HEC-2 to predict gage height and corresponding discharges from channel geometry.
- The predicted discharges and gage heights were plotted on logarthmic graph paper, along with the one reliable discharge measurement.

- A curve of connected straight-line segments was visually fit through the plotted points.
- Endpoint coordinates of each straight-line segment were determined from the rating curve plot and regression analysis to fit a power curve, as previously described (channel control rating development).

A detailed analysis of each instantaneous discharge measurement made during the 1989 water year at each of these stations is presented in Appendix A-5.

Compound Control Rating Development. - The development of rating curves for the compound control stations (South Uvalda, North Uvalda, and Peoria Interceptor) utilized a procedure that was a combination of the procedures delineated in the previous two station control sections (section control and channel control). Additional considerations included the following:

- Discharge measurements were evaluated to determine if the measured discharges and
 corresponding staff readings could occur theoretically. This evaluation was conducted
 using HEC-2 to simulate the channel hydraulics. Discharge measurements that
 appeared invalid based upon the HEC-2 analysis were not used in the rating curve
 development.
- The rating curves required extrapolation beyond the range defined by discharge measurements for high flows. An analysis was performed using HEC-2 to determine if the transition from section control to channel control had occurred at the highest recorded stage. In all cases, this transition had not occurred. Further analysis demonstrated that it was inappropriate to use HEC-2 for the high flow extrapolation.

A hydraulic analysis using HEC-2 was attempted to predict the higher flows. (Note however, that these higher flows are section controlled.) This was done by assuming critical depth at the control section and that normal depth would then occur at the gage section. The present stations were constructed such that there is insufficient distance between the gage section and the control section. The result is that normal depth occurs upstream of the gage section, therefore, yielding an unrealistic result.

The high flow extrapolation was done using the Manning equation:

$$Q = 1.486 AR^{2/3} S^{1/2}$$

where

Q = discharge (cfs);

n = Manning's channel roughness coefficient (dimensionless);

 $A = cross-sectional area (ft^2);$

 $R = \text{hydraulic radius} = \frac{A}{P}$;

P = wetted perimeter (ft); and

S = slope (ft/ft).

The cross-section geometry corresponding to the maximum recorded gage height was plotted from reach survey data to determine the cross-sectional area and wetted perimeter at the location of the staff gage. The slope of the corresponding stream surface energy gradient was not available. Since average streambed slope typically approaches the energy gradient at the higher stages (Rantz 1982), the average streambed slope was computed from contour maps or reach survey data for input to Manning's equation. The channel roughness coefficient, n, was determined from stage-discharge measurements and field observations of streambed and bank cover conditions. The calculated discharge was plotted on logarithmic paper and regression analysis was performed on this line segment as previously described.

Confirmation of the permanence of these rating curves followed the same criteria as previously described. A detailed analysis of each instantaneous discharge measurement made during the 1989 water year at each of these stations is presented in Appendix A-5.

APPENDIX A-3.2

Gage Height vs. Discharge

APPENDIX A-3.3

Head vs. Discharge

APPENDIX A-4

Rating Equations

SW01001, NORTH UVALDA STATION:

DESCRIPTION: BROAD CRESTED CONCRETE WEIR

EQUATION FORM: $Q = p(G-e)^N$

Q = Discharge in cubic feet per second;

(G-e) = head or depth of water on the control in feet; G = the gage height of the water surface in feet;

e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

Gage Height,					
G, Range	р	N	e	Valid 1	Period
(ft)			(ft)	Begin Date	End Date
-0.104 to -0.060	0.882177764	1.444590283	-0.105	10-01-88	09-30-89
-0.059 to 0.000	1.597817538	1.636135791	-0.105	10-01-88	09-30-89
0.001 - 0.015	0.118589583	0.205644337	0.00	10-01-88	09-30-89
0.016 - 0.03	0.184078048	0.310340083	0.00	10-01-88	09-30-89
0.04 - 0.05	0.356680281	0.498980945	0.00	10-01-88	09-30-89
0.06 - 0.09	0.631774902	0.689816811	0.00	10-01-88	09-30-89
0.10 - 0.15	2.323074133	1.230573848	0.00	10-01-88	09-30-89
0.16 - 0.20	5.667685192	1.700702010	0.00	10-01-88	09-30-89
0.21 - 0.515	12.65759878	2.199930256	0.00	10-01-88	09-30-89
0.516 - 0.975	14.63974813	2.419166422	0.00	10-01-88	09-30-89
0.976 - 2.00	14.95376940	3.257434047	0.00	10-01-88	09-30-89
201 - 254	45 64969387	1 647337806	0.00	10-01-88	09-30-89

STATION: SW01003, SOUTH PLANTS DITCH

DESCRIPTION: 90 DEGREE V-NOTCH WEIR PLATE

EQUATION FORM: $Q = p(G-e)^N$

where: Q = Discharge in cubic feet per second;

(G-e) = head or depth of water on the control in feet; G = the gage height of the water surface in feet;

e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

p = regression coefficient (dimensionless); and

N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range	p	N	e	Valid	Period
(ft)			(ft)	Begin Date	End Date
3.43 - 3.62	(1)	(1)	3.43	10-01-88	09-30-89
3.63 - 3.80	2.488803337	2.481549685	3.43	10-01-88	09-30-89
3.80 - 5.43 (2	33.30000000	1.500000000	3.80	10-01-88	09-30-89

- (1) For gage heights between 3.43 ft and 3.62 ft which corresponds to heads of 0.00 ft and 0.19 ft, use the given coefficients for the gage height range of 3.63 ft 3.80 ft. Note that the flow can only be estimated in the low-flow range due to the fact that the nappe may not spring free of the crest when the head is less than 0.2 ft.
- (2) For gage heights above 3.80 ft use the coefficients given to compute a flow. To this add 0.21 cfs, the maximum flow through the V-notch. Note that the flow can only be estimated in this range above 3.80 ft.

STATION: SW02001, LADORA WEIR

DESCRIPTION: 2-INCH-WIDE PLANKS FITTED ON TOP OF A CONCRETE WALL

EQUATION FORM: $Q = p(G-e)^N$

where: Q = Discharge in cubic feet per second;

(G-e) = head or depth of water on the control in feet; G = the gage height of the water surface in feet;

e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero flow for a channel control or a section control of irregular shape;

p = regression coefficient (dimensionless); and

N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range	р	N	e	Valid I	Period
<u>(ft)</u>			(ft)	Begin Date	End Date
4.13 - 4.32	(1)	(1)	4.13	10-01-88	09-30-89
4.13 - 6.13	19.98000000	1.500000000	4.13	10-01-88	09-30-89

(1) For gage heights between 4.13 ft and 4.32 ft, which corresponds to heads of 0.0 ft and 0.19 ft, use the given coefficients for the gage height range of 4.33 ft - 6.13 ft. Note that the flow can only be estimated in the low-flow range due to the fact that the nappe may not spring free of the crest when the head is less than 0.2 ft.

STATION: SW08003, SOUTH FIRST CREEK

DESCRIPTION: CONCRETE COMPOUND WEIR

EQUATION FORM: $Q = p(G-e)^N$

Q = Discharge in cubic feet per second; (G-e) = head or depth of water on the control in feet; G = the gage height of the water surface in feet;

e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

= regression coefficient (dimensionless); and

Gage Height, G, Range	р	N	e	Valid 1	Period
(ft)			(ft)	Begin Date	End Date
0.03 - 0.12	0.274865251	1.562869813	0.00	10-01-88	09-30-89
0.13 - 0.20	30.32336677	3.781175623	0.00	10-01-88	09-30-89
0.21 - 1.38	4.970971764	2.657613623	0.00	10-01-88	09-30-89

STATION: SW11001, PEORIA INTERCEPTOR

DESCRIPTION: FLAT CRESTED WEIR WHICH CONSISTS OF A NARROW PLANK POSITIONED PERPENDICULAR

TO FLOW. CHANGED TO A 90 DEGREE V-NOTCH WEIR ON APRIL 14, 1989.

EQUATION FORM: $Q = p(G-e)^N$

Q = Discharge in cubic feet per second; where:

(G-e) = head or depth of water on the control in feet; the gage height of the water surface in feet;

gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

Gage Height,					
G, Range	P	N	e	Valid 1	Period
<u>(ft)</u>			(ft)	Begin Date	End Date
1.04 - 1.06	3.640718E-12	436.7207643	0.00	10-01-88	04-07-89
1.07 - 1.12	0.051158789	35.71755364	0.00	10-01-88	04-07-89
1.13 - 1.29	1.202206920	7.860705838	0.00	10-01-88	04-07-89
1.30 - 4.32	5.407527455	1.955820912	0.00	10-01-88	04-07-89
0.404 - 0.50	0.236237085	1.280211429	0.39	04-14-89	09-30-89
0.51 - 0.59	1.131299766	1.989813381	0.39	04-14-89	09-30-89
0.60 - 1.05	2.488803337	2.481549685	0.39	04-14-89	09-30-89
1.051 - 1.06	0.123984198	40.32966282	0.00	04-14-89	09-30-89
1.07 - 1.12	0.415469558	19.57665310	0.00	04-14-89	09-30-89
1.13 - 1.29	1.795908698	6.659737538	0.00	04-14-89	09-30-89
1.30 - 4.32	6.058487140	1.884610242	0.00	04-14-89	09-30-89

STATION: SW11002, HAVANA INTERCEPTOR

CONCRETE LINED TRAPEZOIDAL CHANNEL DESCRIPTION:

EQUATION FORM: $Q = p(G-e)^N$

Q = Discharge in cubic feet per second;

(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;

e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape; = regression coefficient (dimensionless); and

Gage Height,						
G, Range	р	N	e	Valid	Period	_
(ft)	•		(ft)	Begin Date	End Date	_
0.01 - 0.025	2.000000126	1.000000012	0.00	10-01-88	09-30-89	
0.026 - 0.10	2.364864829	1.045426716	0.00	10-01-88	09-30-89	
0.11 - 0.175	2.305695547	1.034422377	0.00	10-01-88	09-30-89	
0.176 - 0.24	4.725356666	1.446111016	0.00	04-25-89	09-30-89	
0.25 - 0.32	23.80114393	2.579018353	0.00	04-25-89	09-30-89	
0.33 - 1.39	20.86833977	2.463609783	0.00	04-25-89	09-30-89	
1.40 - 1.91	21,46649374	2.377791962	0.00	04-25-89	09-30-89	
1.92 - 4.14	8.454697601	3.817702957	0.00	04-25-89	09-30-89	
0176 - 414	3 276612758	1 236048284	0.00	10-01-88	04-25-89	

SW12005, SOUTH UVALDA STATION:

V-NOTCH IN A 12 INCH WIDE CONCRETE WEIR DESCRIPTION:

EQUATION FORM: $Q = p(G-e)^{N}$

Q = Discharge in cubic feet per second;
(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;

gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

Gage Height,					
G, Range	p	N	e	Valid	Period
(ft)			(ft)	Begin Date	End Date
3.428 - 3.57	4.315263E-29	48.79427888	0.00	10-01-88	09-30-89
3.58 - 3.84	1.627457E-16	26.03831775	0.00	10-01-88	05-08-89
3.85 - 4.31	7.204057E-14	21.50994769	0.00	10-01-88	05-08-89
4.32 - 4.82	0.000700004	5.768606020	0.00	10-01-88	05-08-89
4.83 - 4.92	1.199150E-29	43.49109493	0.00	10-01-88	09-30-89
4.93 - 5.10	6.693750E-10	14.95383007	0.00	10-01-88	09-30-89
5.11 - 8.00	0.014836562	4.572277074	0.00	10-01-88	09-30-89
3.58 - 4.06	1.931987E-19	31.33173826	0.00	05-09-89	09-30-89
4.07 - 4.82	0.000653393	5.812418902	0.00	05-09-89	09-30-89

SW12007, HIGHLINE LATERAL STATION:

DESCRIPTION: CIPPOLETTI WEIR

EQUATION FORM: $Q = p(G-e)^N$

Q = Discharge in cubic feet per second;

(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;

gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

Gage Height,					
G, Range	. р	N	e	Valid	Period
(ft)	-		(ft)	Begin Date	End Date
0.01 - 0.04	5.999999825	0.99999995	0.00	10-01-88	09-30-89
0.05 - 0.09	11.77702045	1.209511252	0.00	10-01-88	09-30-89
0.10 - 0.20	15.97301939	1.336071751	0.00	10-01-88	09-30-89
0.21 - 0.33	26.14011331	1.642122716	0.00	10-01-88	09-30-89
0.34 - 1.00	54.66181761	2.307513945	0.00	10-01-88	09-30-89

STATION: SW24002, NORTH FIRST CREEK

DESCRIPTION: CONCRETE COMPOUND WEIR

EQUATION FORM: $Q = p(G-e)^N$

where: Q = Discharge in cubic feet per second;

(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;

e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

Gage Height, G, Range	p	N	e	Valid	Period
(ft)			_(ft)_	Begin Date	End Date
0.084 - 0.25	4.547328047	2.470675002	0.00	10-01-88	09-30-89
0.26 - 1.24	3.522261553	2.286416481	0.00	10-01-88	09-30-89
1.25 - 1.70	3.174816454	2.769205688	0.00	10-01-88	09-30-89

STATION: SW36001, BASIN A

DESCRIPTION: 90 DEGREE V-NOTCH WEIR PLATE

EQUATION FORM: $Q = p(G-e)^N$

Q = Discharge in cubic feet per second; (G-e) = head or depth of water on the control in feet; G = the gage height of the water surface in feet;

gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

p = regression coefficient (dimensionless); and N = regression coefficient (dimensionless), generally not equal to p.

Gage Height, G, Range	p	N	e	Valid	Period
(ft)			(ft)	Begin Date	End Date
0.07 - 0.26 0.27 - 1.32	(1) 2.488803337	(1) 2.481549685	0.07 0.07	10-01-88 10-01-88	09-30-89 09-30-89

(1) For gage heights between 0.07 ft and 0.26 ft which corresponds to heads of 0.0 ft and 0.19 ft use the given coefficients for the gage height range of 0.27 ft - 1.32 ft. Note that the flow can only be estimated in the low-flow range due to the fact that the nappe may not spring free of the crest when the head is less than 0.2

STATION: SW37001, FIRST CREEK OFF POST

DESCRIPTION: CONCRETE TRIANGULAR-THROATED FLUME

EQUATION FORM: $Q = p(G-e)^N$

Q = Discharge in cubic feet per second;

(G-e) = head or depth of water on the control in feet;
G = the gage height of the water surface in feet;
e = gage height in feet of zero flow for a section control of regular shape, or the gage height of effective zero

flow for a channel control or a section control of irregular shape;

Gage Height,							
G, Range	p	N	е	Valid Period			
(ft)			(ft)	Begin Date	End Date		
0.50 - 0.54	0.124999989	0.99999979	0.50	06-15-89	09-30-89		
0.55 - 0.59	1.226773025	1.709511275	0.50	06-15-89	09-30-89		
0.60 - 0.75	4.306533142	2.231012279	0.50	06-15-89	09-30-89		
0.76 - 2.50	6.853180828	2.566146561	0.50	06-15-89	09-30-89		

APPENDIX A-5

Comparison of Instantaneous Discharge
Versus Computed Discharge

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE NORTH UVALDA (SW01001)

(12)	Comments			
(11) Measurements	used for Rating Curve Development	1	ar are	
(10)=(4)-(9) (11) Measurem	Difference in Gage ht. (ft.)	80 water vear	l maner your	
6)	Computed Gage ht. (ft.)	during the 10	Cr our Summe	
(8) =100* [(6)-(7)]/(7)	Difference in Discharge (%)	apour anothe	S WOLC INGUC	
6)	Be Computed in (cfs) (%) (ft.)		measmemen	
(9)	Instan- taneous Discharge (cfs)		ous discharge	
(5) New	Start, Stop Gage Height (feet)		No instantant	
(4) Old	Start, Stop Gage Height (feet)			
(3)	Start, Stop Time (brs)			
(2)	Date			
ε	Meas- urement Number			

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE SOUTH PLANTS DITCH (SW01003)

		 	_	-11
(12)	Comments			
(11) Measurements	used for Rating Curve Development	surements were made during the 1989 water year at this station.		
(10)=(4)-(9) (11) Measurem	Difference in Gage ht. (ft.)	89 water year		
6)	Computed Gage ht (ft.)	during the 198		
(8) =100* [(6)-(7)]/(7)	Difference in Discharge (%)	s were made		
ω	Computed Discharge (cfs)	measurement		
(9)	Instan- taneous Discharge (cfs)	No instantaneous discharge mea		
(S) New	Start, Stop Gage Height (feet)	No instantane		
(t)	St			
(3)	Start, Stop Time (hrs)			
(2)	Date			
(1)	Meas- urement Number			

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE LADORA WEIR (SW02001)

		 _	
(12)	Comments		
(11) Measurements	used for Rating Curve Development	No instantaneous discharge measurements were made during the 1989 water year at this station.	
(10)=(4)-(9) (11) Measurement	Difference in Gage ht. (ft.)	39 water year	
6)	Computed Gage ht. (ft.)	during the 198	
(8) =100* [(6)-(7)]/(7)	Difference in Discharge (%)	s were made	
6)	Computed Discharge (cfs)	measurement	
(9)	Instan- taneous Discharge (cfs)	ous discharge	
	Start, Stop Gage Height (feet)	No instantane	
(4)	Start, Stop Gage Height (feet)		
(3)	Start, Stop Time (hrs)		
(2)	Date		
(1)	Meas- urement Number		

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE * SOUTH FIRST CREEK (SW08003)

^{*} Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE * PEORIA INTERCEPTOR (SW11001)

(12)			Comments	RLSA, Long throated flume, downstream 30' below gage	RLSA, 200mm flume, downstream 30' below gage	RLSA, 100mm flume, downstream 100' below gage	
(11) Measurements		Curve	Development				
(10)=(4)-(9) (11) Measurem	Difference in	Gage ht.	(ft.)	0.03	-0.03	0.10	
(6)	Computed	Gage ht.	(ft.)	0.30	0.33	0.21	
(8) =100* [(6)-(7)]/(7)	Difference	Discharge Discharge	(%)	-18.8	23.1	-64.3	
(L)	Computed	Discharge	(cfs)	0.16	0.13	0.14	
(9)	Instan-	Discharge	(cfs)	0.13	0.16	0.05	
(S) New	Start, Stop	Height	(feet)		:	:	
(4) Old	Start, Stop	Height	(feet)	0.20	0.60	0.70	21.0
(3)	7	Time	(hrs)	3011 3111	1710 1777	0845 0900	2017,0100
(2)			Date	0470	04/07/40	00/7/80	02/4/102
(1)	ž	Meas-	Number		- ,	٦, ٣	ח

^{*} Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE * HAVANA INTERCEPTOR (SW11002)

					_	_	
(12)			Comments	RLSA, Pygmy #625, downstream 8' below bubble line	RLSA, Pygmy #625, 10' above gage	RLSA, 200mm flume, downstream 350' below gage	RLSA, 200mm flume, downstream 500' below gage
ž	used for Rating	Curve	Development			×	×
(10)=(4)-(9)	Difference	Gage ht	(ft.)	N/A	0.07	0.01	-0.02
(6)	Computed	Gage ht	(ft.)	N/A	0.17	0.17	0.21
(8) =100* [(6)-(7)]/(7)	Difference in	Discharge	(%)	N/A	-38.3	-7.5	14.0
6	Computed	Discharge	(cfs)	N/A	09.0	0.40	0.43
9)	Instan- taneous	Discharge	(cfs)	1.5	0.37	0.37	0.49
(5) New	Start, Stop Gage	Height	(teet)	N/A	0.29	0.23	0.24
(4) Old	Start, Stop Gage	Height	(feet)	0.52		0.18**	0.19**
(3)	Start. Stop	Time	(hrrs)	1515 1545		=	1020,1030
(2)			Date	04/11/80	0476/80	07/20/89	09/27/89
Œ	Meas	urement	Number	-	,	1 "	4

^{*} Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE * SOUTH UVALDA (SW12005)

				\neg		T		\sqcap
(12)	Comments	RLSA, Pygmy #625, downstream 50' below gage	RLSA, Pygmy #625, downstream 50' below gage	RLSA, Pygmy #625, downstream 50' below gage	RLSA, Long throated flume, downstream 30' below gage	RLSA, 200mm flume, downstream 40' below gage	RLSA, 200mm flume, downstream 30' below gage	RLSA, 200mm flume, downstream 50' below gage
(11) Measurements used for	Rating Curve Development	×	×		×	×	×	
(10)=(4)-(9) Difference	in Gage ht. (ft.)	0.01	0.00	-0.06	0.00	0.00	0.02	0.08
(6)	Computed Gage ht. (ft.)	3.84	3.85	3.88	3.84	3.88	3.81	3.74
(8) =100* [(6)-(7)]/(7) Difference	in Discharge (%)	-7.1	7.1	59.1	-3.7	0.0	-16.7	48.5
Θ	Computed Discharge (cfs)	0.28	0.28	0.22	0.27	0.54	0.36	0.33
(6) Instan-	taneous Discharge (cfs)	0.26	0.30	0.35	0.26	0.54	0.30	0.17
(5) New Start. Stop	Gage Height (feet)	1	:	1		:	0.51	0.50
(4) Old Start. Stop	Gage Height (feet)	3.85.3.85	3.85.3.85		3.84,3.84	3.88,3.88	3.83**	3.82**
(3)	Start, Stop Time (hrs)	1520.1547	1544.1613	1203,1331	1525,1535	1330,1349	0910,0920	1515,1515
(2)	Date	03/1/89	03/21/89	04/17/89	04/21/89	06/20/89	68/97/60	68/67/60
(1)	Meas- urement Number		, ,	6	4	2	٥	7

^{*} Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.
** Computed by (New Gage + 3.32 offset)

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE HIGHLINE LATERAL (SW12007)

			_	-11
(12)	Comments			
(11) Measurements	used for Rating Curve Development	No instantaneous discharge measurements were made during the 1989 water year at this station.		
(10)=(4)-(9) (11) Measurement	Difference in Gage ht (ft.)	89 water year		
6)	Computed Gage ht. (ft.)	during the 19		
(8) =100* [(6)-(7)]/(7)	Computed in Discharge (cfs) (%)	s were made		
ω		measurement		
(9)	Instan- taneous Discharge (cfs)	ous discharge		
(5) New	Start, Stop Gage Height (feet)	No instantane		
(4) Oid	Start, Stop Gage Height (feet)			
(3)	Start, Stop Gage Time Height (hrs) (feet)			
(2)	Date			
(1)	Meas- urement Number			

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE * NORTH FIRST CREEK (SW24002)

***************************************		- 1	Г			Т	Т		ı
(12)		Comments		RLSA, Pygmy #625, downstream 40' below gage	DI CA Dymny #625 downstream 35' below page	Man, I Jam's House commend and the second se	KLSA, ZOOMM Hume, downsneam 30 octow gage	RLSA, Pygmy #625, downstream 30' below gage	
(11) Measurements used for	Rating Curve	Development					X		
(10)=(4)-(9) Difference	in Gage ht	(ft.)		0.12	:	0.11	0.00	-0.05	
(6)	Computed Gage ht.	(ft.)		0.35	36.0	0.33	0.52	96.0	
(8) =100* [(6)-(7)]/(7) Difference				49.2	607	40.3	8.0	13.3	
6	Computed	(cfs)		0.63	3,0	0.00	0.79	3.0	
(6) Instan-	taneous	(cfs)		0.32		0.31	0.79	3.4	
(5) New	Gage	(feet)		ı			1		
(4) Old	Gage	(feet)		0 47 0 47		0.46,0.47	0.52.0.52		1000
(3)	Start, Stop	(hrs)		1510 1530	1010,1000	1056,1128	1005,1030	0030 1041	J. 0710000
8		Date		04,004,00	20/00/40	04/21/89	05/03/89	08/11/50	COLUMN TO
(£)	Meas-	Number			1	2	3		*

* Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE BASIN A (SW36001)

(12)	Comments			
~	used for Rating Curve Development	No instantaneous discharge measurements were made during the 1989 water year at this station.		
(10)=(4)-(9)	Difference in Gage ht. (ft.)	89 water year		
(6)	Computed Gage ht. (ft.)	during the 198		
(8) = $100*$ (9) [(6)-(7)]/(7)	Difference in Computed in Discharge Gage ht. (%) (ft.)	s were made		
6	Computed Discharge (cfs)	measurement		
(9)	Instan- taneous Discharge (cfs)	ous discharge		
(S) New	Start, Stop Gage Height (feet)	No instantane		
(t)	Start, Stop Gage Height (feet)			
(3)	Start, Stop Time (hrs)			
(2)	Date			
(1)	Meas- urement Number			

COMPARISON OF INSTANTANEOUS DISCHARGE VERSUS COMPUTED DISCHARGE * FIRST CREEK OFF-POST (SW37001)

		11	$\overline{}$		- 71
(12)	Comments	RSLA, Pygmy #625, upstream 40' above gage	RSLA, Pygmy #625, upstream 30' above gage	RLSA, 200mm flume, upstream 40' above gage	RLSA, 100mm flume, downstream 10' below gage
(11) Measurements	used for Rating Curve Development				×
(10)=(4)-(9) (11) Measurem	Difference in Gage ht. (ft.)	N/A	N/A	N/A	1
(6)	Computed Gage ht. (ft.)	N/A	N/A	N/A	60:0
(8) =100* [(6)-(7)]/(7)	Difference in Discharge (%)	A/N	N/A	N/A	0.0
6	Computed Discharge (cfs)	N/A	N/A	N/A	0.02
(9)	Instan- taneous Discharge (cfs)	0.70	0.31	0.54	0.02
(5) New	Start, Stop Gage Height (feet)		1		0.58
(4) Old	Start, Stop Gage Height (feet)	0.51	0.52	0.61,0.58	1
(3)	Start, Stop Time (brs)			1045,1114	1546,1550
(2)	Date	04 107 100	04/01/09	05/03/89	07/13/89
(1)	Meas- urement		1	, ~	4 **

Computed discharge and computed gage height were obtained from rating curves and do not necessarily represent gage height output produced from strip charts.
 New control structure installed June 1989.

APPENDIX A-6

Continuous Gage Height Recorders
Equipment and Procedures

APPENDIX A-6.1

Stevens Type F Equipment Specifications and Procedures

A-6.1 Stevens Type F Recorder Procedures

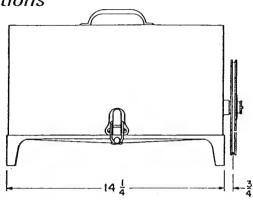
During Water Year 1989 there were eleven surface water stations equipped with Stevens Type F water level recorders. The Stevens Type F recorders currently in use are Model 68's equipped with quartz multispeed timers and either multiple D-cell batteries or a single mercury battery power source. The Stevens Type F recorder is attached to a float, beaded wire, and pulley. Changing water levels in the stilling well cause the float to rise and fall which turns the recorder's drum proportionally. The quartz multispeed timer moves a pen across the strip chart at a uniform speed. The resulting record produced is a graph of water level versus time.

Weekly activities at the continuous monitoring stations included collecting and replacing strip charts, checking recorder operation, calibrating strip charts to the outside observed stage and initial time, and removing obstructions from stilling wells, channel sections and control structures. Freezing conditions prohibited the use of the recorders from late November 1988 through February 1989. Stage data is invalid during periods of freezing because the frozen water in the stilling well incapacitates the recorder's float and pulley system.

The strip chart analog stage data were reduced to a digitized format using the computer program CPSPC (Radian Corp., October 1987, Version 3.1) in conjunction with a digitizer. After a strip chart has been digitized, the software program transforms the digital file into units used by the analog record. In this case, the scale was correlated to Julian date and scientific hours for time and to 0.01 ft for gage height. The minimal digitized strip chart points chosen were 0.00, 12.00, and 24.00 for each record day. Other significant stage points selected for digitization were high flow events, when gage heights were digitized at a minimum of 15 minute intervals, and any stage points that exhibited 0.1+ ft of deflection within any 2 hour period. Finally, the digitized stage output was compared to the strip chart analog record and corrected to the observed staff gage settings.

STEVENS TYPE F Water-level Recorder





GAGE SCALES ADAPT RECORDER TO WATER-LEVEL RANGE

The relationship between the rotation of the float pulley and the chart drum is set by gearing. Changes in the gearing, or the pulley circumference, thus affect the ratio between the chart record and water-level changes. This ratio is known as gage scale.

To make a field change from any scale listed in the Table, below, (except 1:20 and 1:24) to another, requires only the substitution of a pair of gears. The 1:20 and 1:24 scales are obtained by installing the 750 mm. or 36 in. circumference ring on the float pulley of a Recorder geared for the 1:10 or 1:12 scales, respectively.

Table 3 GAGE SCALES FOR STEVENS TYPE F RECORDER (obtained by gearing)

Water Level	Valu	ie oī	
Change for 1	Smallest		Float Pulley
Rev. of Drum	Chart L	Division	Required
System -	F1/F2	F3 Chart	
1.0 ft.	.01 ft.	.1 in.	18 in. circ.
2.0 ft.	.02 ft.	.2 in.	18 in. circ.
5.0 ft.	.05 ft.	.5 in.	18 in. circ.
10.0 ft.	.10 ft.	1.0 in.	18 in. circ.
20.0 ft.	.20 ft.	2.0 in.	36 in. circ.
English Duo-Decimal System—		Chart	
1.2 ft.	.01 ft.		18 in. circ.
2.4 ft.	.02 ft.		18 in. circ.
6.0 ft.	.05 ft.		18 in. circ.
12.0 ft.	.10 ft.		18 in. circ.
24.0 ft.	.20	ft.	36 in. circ.
	F4 (Chart	
0.3 m.	2 mm.		375 mm. circ.
0.6 m.	4 mm.		375 mm. circ.
1.5 m.	10 mm.		375 mm. circ.
3.0 m.	20 mm.		375 mm. circ.
6,0 m.	40 mm.		750 mm. circ.
	Change for 1 Rev. of Drum System — 1.0 ft. 2.0 ft. 5.0 ft. 10.0 ft. 20.0 ft. **mal System — 1.2 ft. 2.4 ft. 6.0 ft. 12.0 ft. 24.0 ft. 0.3 m. 0.6 m. 1.5 m. 3.0 m.	Change for 1 Sma Rev. of Drum Chart L	Change for 1 Smallest Chart Division

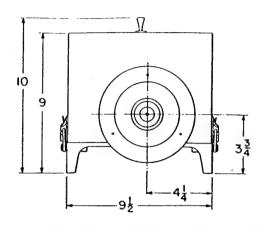
NOTE: Range is unlimited since the chart drum may make any number of revolutions.

Leupold & Stevens, Inc.

P.O. Box 688

Tel. 503 646-9171

Beaverton, Oregon 97005 U.S.A. · Cable LEUSTEV, Beaverton.



Basic Type F Recorder Specifications

Float operated water level recorder with horizontal ball bearing chart drum; rectangular chart 12 inches (or 30 cm) x 9.6 inches; capillary pen with Lucite reservoir; 1 oz. black ink; 4 legged cast aluminum base for shelf or table mounting; metal cover without port.

APPLICATION OPTIONS:

Type	ωf	nen	drive:
I vpe	OΙ	pen	urive:

8 day spring driven clock 30 day weight driven clock synchronous motor for □ battery driven clock, 1.5 VDC Time scale: (refer to Table 1 for availability) Gage scale: (refer to Table 3 for availability) Chart:

☐ F3 ☐ F1 □ F7 □ F2 □ F4 □ F8

Float Pulley:

- 18 in. or 375 mm circumference for beaded float line perforated tape 36 in. or 750 mm pulley ring for 1:20 and 1:24 gage scales

Float line/tape:

feet stainless steel float line with set end hooks feet stainless steel perforated and graduated float tape with set end hooks and index bracket

Float with counterweight:

2½ in. ☐ 5 in. ☐ 6 in. ☐ 3 in. 3½ in. 7 in. □ 8 in. ☐ 4 in.

Accessories:

- Scow float with adjustable anchor rod and counterweight
 Automatic clock starter (for 8 day clock
- Cover with viewing port
- Pencil stylus (in place of pen)

Note: See Price List for options available. Manufacturer reserves the right to make changes in design or materials for product improvement, without notice.

APPENDIX A-6.2

Datapod Equipment Specifications and Procedures

A-6.2 DP115 Datapod Procedures

The Omnidata International, Inc. model DP115 datapod, equipped with a 10-turn potentiometer, operates in conjunction with the Stevens Type F recorder. Data collected by the DP115 is used to obtain digital stage measurements in conjunction with the Stevens recorder.

Proper setup of the DP115 datapod requires that two recording functions are set:

- Resolution (stage change required to record a data point); and
- Sampling time interval.

The recording functions are set on the datapod using the control switches located on the inside panel. Switches 1 and 2 control resolution, and switches 3 and 4 control sampling interval. A resolution of 0.01 ft and a sampling interval of 30 minutes is set on the data pod. The datapod will record a change in stage of 0.01 ft or greater at 30 minute intervals, however, if the stage change is less than 0.01 ft the datapod does not record a data point. This function allows the datapod to conserve space on the data storage module (DSM). A stage data point is also recorded when the unit is powered up and will record a data point at 24 hour intervals regardless of any change in stage.

The datapod's DSM is changed monthly along with the units batteries. Data "short dumps" are acquired weekly and recorded in the log book. The following procedures are used to acquire the "short dump" and to change the DSM and batteries on the datapod.

Procedure:

Note: ** indicates that a display has to be recorded in the log book.

[] indicates a display that will appear on the DP115.

- 1. **RECORD station number in the log book.
- 2. **RECORD the DP115 serial number on the log book.
- 3. **RECORD the display message [RUN] in the log book: Display.
- 4. Loosen the four screws on the face plate and separate the face plate from the case. (do not remove screws if only a short dump is being acquired.)

SHORT DUMP

Note: The DP115 will advance through the following sequence fairly quickly. If a display is missed, the sequence can be reinitiated by pressing the button on the outer case after the last display [RUN] is shown.

Push the button on the outer case -

[DLY] will be displayed, then -

[CHN1] will be displayed, then -

a number will be displayed indicating the current stream stage.

**RECORD the number with the label: CHN1

[ERR] will be displayed, then -

a number indicating the number of errors will be displayed.

**RECORD this number with the label: ERR

[TIME] will be displayed, then -

a number indicating the time (relative to startup) will be displayed.

**RECORD this number with the label: TIME

[DSM USED] will be displayed, then -

a number will be displayed indicating the amount of data storage modules space so far.

**RECORD this number with the label: DSM USED

[RUN] will be displayed indicating the DP115 is finished with the short dump.

Note: continue procedures only if DSM and batteries are to removed.

Caution: There is a 24- hour clock in the DP115 that displays time to the nearest tenth hour.

Example: When the [TIME] display reads XXX.1, the DP115 has advanced 6 minutes into the hour.

The DP115 clock begins as soon as the last battery is inserted.

The DP115 is set to make a stream gage recording every 30 minutes. A 30 minute interval will be denoted on the [TIME] display as XXX.0 or XXX.5. If it is getting close to a recording interval such as XXX.4 or XXX.9, wait until after the reading has been make and then continue. (The LED will flash when a reading is being taken.)

- 6. Remove a battery from the battery pack to power down the DP115.
- 7. **RECORD the time of day with the label: Stop Time.
- 8. **RECORD the staff gage reading with the label: Staff Gage (ft).

Caution: Be sure your fingers are clean and dry before touching the DSM. Care should be taken no to touch any of the pins on the DSM.

9. Remove the DSM from the back of the face plate by gently pulling it straight up and place it in the protective container with the pins on the DSM inserted into the anti-static foam in the plastic storage container.

POWER UP

- 10. Replace the battery removed (or replace all batteries) to power up the DP115.
- 11. [DATA POD 115] will appear in the display window, then -
- [SAM] will appear in the display window, then a number indicating the sample interval.
 - **RECORD this number with the label: SAM.
- 13. [RES] will appear in the display window, then -a number indicating the deviation from straight-line resolution.**RECORD this number with the label: RES
- 14. [DLY] will appear in the display window, then -
- 15. [CHN1] will appear in the display window, then a number indicating the sensor test for Channel 1.

 **RECORD this number with the label: CHN1.
- 16. Push in and hold the external button until [PLUG IN DSM PUSH] appears in the display window, then -
- 17. Insert a new DSM in the DP115.
 - **RECORD the DSM number with the label: DSM#IN

Note: If either test fails, remove a battery, replace the DSM with another one and start the procedure again from "Power Up".

- 23. If both tests pass:
 - **RECORD the time of day with the label: Start Time.
 - **RECORD the staff gage height with the label: Staff Gage (ft).
- 24. [RUN] should then be displayed in the display window.
 - **RECORD RUN with the label: DISPLAY
- 25. Replace the face plate on the case and tighten the 4 screws.

The DSM containing data is read with an Omnidata Model 217 Reader. The DSM Reader transmits the data from the DSM to a computer file where it can be further reduced to a stream stage record.

DP115 DATAPOD SPECIFICATIONS

FUNCTION:

Single channel stream stage recorder.

TYPE OF SENSORS:

10-turn potentiometer. 5,000 to 100,000 Ohm resistance.

RESOLUTION:

0.01 foot in 10 feet of water.

RECORDING FUNCTIONS:

Records time of change and amount of change in water level.

SAMPLING INTERVALS:

User sets the time of day.

INPUT CONNECTOR:

3-pin environmentally sealed.

DATA STORAGE:

Medium: Non-volatile, interchangeable memory module. Retrieval: Via built-in display or Model 217 Reader.

OPERATING CONTROLS AND DISPLAY:

Display: 4 1/2 digit LCD with low battery indicator. Push Button: control data display and retrieval.

CLOCK ACCURACY:

+- 3 minutes per month (-10C to + 60C).

SELF TEST:

Performs self test functions on power-up.

OPERATING ENVIRONMENT:

-35 deg C to +60 deg C, 0 to 100% RH, dust and water tight.

POWER:

8 alkaline AA penlight cells.,

SIZE AND WEIGHT:

6.3" x 3.3" x 2.3", 1.2 lb.

APPENDIX A-6.3

Data Logger Equipment
Specifications and Procedures

Data Logger/Bubbler System Procedures

Four Campbell Scientific CR-10 data logger/bubbler systems were put into operation at RMA during WY89. The CR-10 data logger/bubbler system provides stream stage data throughout the year including periods of freezing conditions.

Customized software was developed to operate the data logger and associated bubbler system. The data logger/bubbler system software controls several functions:

- operating the system on a specified uniform time interval;
- performing the calibration calculations; and
- storing the data in the RAM pack storage module.

This software can be loaded either by the use of the hand-held display or by transferring the program from a PC compatible computer to the unit's RAM pack storage module, then down loading the program from the RAM pack into the data logger. The time interval between the start of each measurement cycle is user-selectable and may range from 20 seconds to 6554 seconds. The measurement cycle interval used during WY89 was 900 seconds (15 minutes). Calibration of the data logger/bubbler system is based on two different pressure measurements made at a known distance apart in a reference cylinder located in each station's gage house. The software residing in the data logger performs the calibration calculation prior to each measurement cycle. During the routine monthly maintenance, the calibration is checked using the station's staff gage reading as a reference point, so that the accuracy of each measurement can be verified.

Data are retrieved from the from the RAM pack storage module using either SMCOM or PC208 software. Both SMCOM and PC208 are available from Campbell Scientific, Inc. These communication software programs run on PC compatible computers, additionally, the PC208 software also serves as a simple data formatting and programming tool for the data logger.

Various field operating procedures were used during WY89 for proper and continual operation of CR-10 data logger/bubbler system stations. They are as follows:

1. Reading and Recording the Current Datalogger Output

This procedure is performed during each weekly station visit. Each CR-10 is equipped with a hand help keypad and display. The following key entries denote specific display readouts. Output from the keypad's display is recorded in the field log book and a data sheet that is kept in the gage house. Additionally, nitrogen tank pressure, staff gage reading, and flow condition are recorded in the log book and data sheet.

```
*5 - (Real Time)
A - The Current Year
A - The Julian Day
A - The Time - Mountain Standard
*6 - (Field Data)
#1 - Head above tube in stream.
#2 - Depth in reference tube above top line.
A
#3 - Ambient Temp. - °C
#4 - Reference differential - distance between lines in reference tube - (approx. 1 ft - 1.0).
Α
#5 - Battery voltage - should be above 12 v.
#6 (with Isco sampler), 0.01 = sample taken, 0.00 = no sample.
#20 and #21 - Time sample(s) taken.
       #20 - XXXX divide by 24 and add 1 = (day sample taken).
       #21 - minutes + #20 = (actual time sample taken).
```

2. Changing Batteries

The CR-10 data logger/bubbler system is powered by an industrial 12-volt, 15 amp-hour, sealed lead-acid battery. When the voltage falls below 12 volts, the battery is changed. The battery could be damaged if it is left in the field when the voltage drops below 12 volts. This is especially critical in the cold winter months.

The CR-10 has an internal battery pack consisting of eight alkaline D-cell batteries, that can be used as a back-up for the primary power supply. The following procedure is used to keep power applied to the unit while the external battery is being changed:

- 1. Insert the one D-cell battery back into the internal battery pack.
- 2. Disconnect the leads from the discharged external battery.
- Connect a charged external battery.
- 4. Remove the D-cell battery from the internal battery pack.

3. Changing Nitrogen Tanks

Industrial nitrogen is supplied to the bubbler from a standard 2,200 psi nitrogen tank. The tank is equipped with a low pressure regulator to maintain a constant flow of 9 psi to the bubbler. The pressure to the bubbler can be changed by using the T-handle on the regulator. The regulator also has a gauge that indicates the pressure of nitrogen in the tank. When the tank pressure drops to approximately 500 psi, it is replaced with a full one. The following procedure is used to change the nitrogen tank:

- 1. With hand-held display, check *5 mode time to be sure that the instrument is not about to sample.
- 2. Close the valve on the top of the nitrogen tank.
- 3. With a 7/8" wrench, unscrew the flare nut on the regulator from the nitrogen tank orifice.
- 4. Unhook the safety chain and remove the empty tank from the shelter.
- 5. Place a full tank in the shelter and fasten the safety chain around it.
- 6. Place the regulator on the full tank and tighten the flare nut.
 - Note: Slightly wiggling the regulator while tightening the flare nut will help ensure a tight fit to the mating fitting on tank.
- 7. Open the valve at the top of the bottle. The pressure to the bubbler should read 9 psi.
- 8. Check for leaks around the regulator flare nut and tank orifice. After the regulator is attached to the new tank, open the T-handle until 0 psi is read on low pressure gage. Observe the tank pressure gauge to determine if any pressure is lost (15 minutes should be adequate). If the pressure drops, there is a leak in the connection. If a leak is detected, close the valve on top of the tank and remove the regulator. Place the regulator in a different position on the orifice and retighten the flare nut. Repeat the procedure to check for leaks.

SPECIFICATIONS

The following electrical specifications are valid for an ambient temperature range of -25 °C to +50 °C unless otherwise specified.

ANALOG INPUTS

NUMBER OF CHANNELS: 12 single ended or 6 differential with any combination, software selectable.

CHANNEL EXPANSION: Increments of 32 channels multiplexed through a single CR10 channel with the Model AM32 Relay Scanner. Maximum of 6 AM32's possible.

ACCURACY OF VOLTAGE MEASUREMENTS AND ANALOG OUTPUT VOLTAGES: 0.2% of FSR, 0.1% of FSR (0 to 40 °C).

RANGE AND RESOLUTION: Ranges are software selectable for any channel. Resolution for single ended measurements is twice the value shown.

Full Scale Range Resolution

±2.50 volts
±0.25 volts
±25.0 millivolts
± 7.5 millivolts
± 2.5 millivolts
0.33 microvolts
0.33 microvolts

INPUT SAMPLE RATES: The fast or slow A/D conversion on the four lowest input ranges uses a 250 us or 2.72 ms signal integration time, respectively. Two integrations, separated in time by ½ of an AC line cycle, are used with the 60 Hz or 50 Hz noise rejection option. Differential measurements include a second sampling with reversed input polarity to reduce thermal offset and common mode errors. Input sample rates are the time required to measure and convert the result to engineering units.

Fast single ended voltage:
Fast differential voltage:
Slow single ended voltage:
Slow differential voltage:
Slow differential voltage:
Diff. w/60 Hz rejection:
Fast diff. thermocouple:

2.6 ms
4.2 ms
9.2 ms
9.2 ms
9.5 ms
8.6 ms

INPUT NOISE VOLTAGE:

Fast differential — 0.82 microvolts RMS Slow differential — 0.25 microvolts RMS Diff. w/60 Hz

rejection – 0.18 microvolts RMS COMMON MODE RANGE: ±2.5 volts.

DC COMMON MODE REJECTION: >140 dB.

NORMAL MODE REJECTION: 70 dB (60 Hz with slow differential measurement).

INPUT CURRENT: 3 nanoamps max.

INPUT RESISTANCE: 200 gigohms.

EXCITATION OUTPUTS

DESCRIPTION: The CR10 has 3 switched excitations, active only during measurement, with only one output active at any time. The off state is high impedance.

RANGE: ±2.5 volts.

RESOLUTION: 0.67 millivolts.

ACCURACY: Same as voltage input.

OUTPUT CURRENT: 20 mA @ \pm 2.5 V, 35 mA @ \pm 2.0 V, 50 mA @ \pm 1.5 V.

FREQUENCY SWEEP FUNCTION: A swept frequency square wave output between 0 and 2.5 volts is provided for vibrating wire transducers. Timing and frequency range are specified by the instruction.

PERIOD AVERAGING MEASUREMENTS

DEFINITION: The time period for a specified number of cycles of an input frequency is measured, then divided by the number of cycles to obtain the average period of a single cycle.

INPUTS: Any single ended analog channel; signal dividing or AC coupling is normally required.

INPUT FREQUENCY RANGE:

Range Code	Preamp Gain	Input Hysteresis	Maximum Frequency
4	1	10 mV	200 kHz
3	10	1 mV	50 kHz
' 2	33	300 uV	20 kHz
1	100	100 uV	8 kHz

REFERENCE ACCURACY: ±40 ppm.

RESOLUTION: ±100 nanoseconds divided by the number of cycles measured. Resolution is reduced by signal noise and for signals with a slow transition through the zero voltage threshold.

TIME REQUIRED FOR MEASUREMENT: Signal period times the number of cycles measured plus 1.5 cycles; minimum measurement time is 2 ms.

RESISTANCE AND CONDUCTIVITY MEASUREMENTS

ACCURACY: 0.015% of full scale bridge output, limited by the matching bridge resistors. The excitation voltage should be programmed so the bridge output matches the full scale input voltage range.

MEASUREMENT TYPES: 6 wire and 4 wire full bridge; 4 wire, 3 wire, and 2 wire half bridge. Bridge measurements are ratiometric and dual polarity to eliminate thermal emf's. AC resistance measurements use a dual polarity 750 us excitation pulse for ionic depolarization, with the signal integration occurring over the last 250 us.

PULSE COUNTERS

NUMBER OF PULSE COUNTER CHANNELS: 2 eight bit or 1 sixteen bit selectable.

MAXIMUM COUNT RATE: 2000 Hz, eight bit counters; 250 kHz, sixteen bit counters. Pulse counter channels scanned at 8 Hz.

MODES: Switch closure, high frequency pulse, and low level AC.

SWITCH CLOSURE MODE Minimum Switch Closed Time: 5 ms. Minimum Switch Open Time: 6 ms. Maximum Bounce Time: 1 ms open without count

HIGH FREQUENCY PULSE MODE Minimum Pulse Width: 2 us. Maximum Input Frequency: 250 kHz. Voltage Thresholds: Count upon transition from below 1.5 V to above 3.5 V. Maximum Input Voltage: ±20 V.

LOW LEVEL AC MODE (Typical of magnetic pulse flow sensors, selected anemometers, etc.)

Min AC Input Voltage 6 mV RMS Input Hysteresis: 11 mV. Max. AC Input Voltage: 20 V RMS

Frequency Range:

AC Input (RMS)

20 millivolts

50 millivolts

1 Hz to 100 Hz

50 millivolts

0.5 Hz to 400 Hz

150 millivolts to 20 V

0.3 Hz to 1000 Hz

(Consult factory if higher frequencies are desired.)

DIGITAL I/O PORTS

8 ports, software selectable as binary inputs or control outputs.

OUTPUT VOLTAGES (no load): high $-5 \text{ V} \pm 0.1 \text{ V}$; low -<0.1 V.

OUTPUT RESISTANCE: 500 ohms.

INPUT STATE: high -> 3 V; low -< 0.8 V.

INPUT RESISTANCE: 100 kohms.

TRANSIENT PROTECTION

All input and output connections to the CR10 module are protected using RC filters or transzorbs connected to a heavy copper bar between the circuit card and the case. The CR10WP Wiring Panel includes additional spark gap and transzorb protection.

CPU AND INTERFACE

PROCESSOR: Hitachi 6303.

MEMORY: 32k ROM, 16k RAM expandable to 64k.

DISPLAY: 8 digit LCD (0.5" digits).

PERIPHERAL INTERFACE: 9 pin D-type connector for keyboard/display, storage module, cassette, modem, printer, and RS232 adapter. Baud rates selectable at 300, 1200, 9600, and 76,800.

CLOCK ACCURACY: ±1 minute per month...

MAXIMUM PROGRAM EXECUTION RATE: System tasks initiated in sync with realtime up to 64 Hz. One measurement with tape transfer is possible at this rate without interruption.

SYSTEM POWER REQUIREMENTS

VOLTAGE: 9.6 to 16 volts.

TYPICAL CURRENT DRAIN: 0.5 mA quiescent.

13 mA during processing, and 35 mA during analog measurement.

BATTERIES: 7.5 Ahr alkaline D-cells or 5 Ahr rechargeable lead acid batteries, standard

PHYSICAL SPECIFICATIONS

SIZE: 7.8" x 3.5" x 1.5"; 9" x 3.5" x 2.9" with CR10WP Wiring Panel. Input connectors extend length 0.15".

WEIGHT: 2 lbs.

WARRANTY

Two years against defects in materials and workmanship.



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P.O. Box 551 Logan, UT 84321 Phone (801) 753-2342 TLX 453058 9699 45th Avenue Edmonton, Alberta T6E 5Z8 CANADA Phone (403) 434-9421 TLX 037-2966 (EDM) College Road/Sutton Bonington Loughborough, LE12 5RA ENGLAND Phone 05097 2516 TLX 94016393 (CAMP G)

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